

**ENVIRONMENTAL PROTECTION AGENCY**  
**40 CFR Part 80, 86**  
**[AMS-FRL- 6196-3]**  
**RIN**

**Control of Emissions of Hazardous Air Pollutants from Mobile Sources**

**AGENCY:** Environmental Protection Agency

**ACTION:** Notice of Proposed Rulemaking

**SUMMARY:** A range of compounds known as hazardous air pollutants are emitted from motor vehicles and fuels and are known or suspected to have serious health impacts. This document describes EPA's program to address emissions of hazardous air pollutants from mobile sources. In this notice, we develop a framework to construct a national mobile source air toxics program and propose additional controls on gasoline to prevent increases in emissions of benzene. We also describe a plan to continue to conduct research and analysis on mobile source air toxics and make a commitment to revisit the issue of mobile source air toxics controls in a 2004 rulemaking.

More specifically, we look at the various compounds that are emitted by motor vehicles and identify those compounds that should be considered Mobile Source Air Toxics (MSATs). Our list of 21 MSATs includes various volatile organic compounds (VOCs) as well as metal compounds and diesel exhaust. We then evaluate the effectiveness of current controls in reducing on-highway emissions of these MSATs. Our analysis shows that the programs we currently have in place or have recently proposed are expected to yield significant reductions of mobile source air toxics. Between 1990 and 2020, these programs are expected to reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 75 percent or more. In addition, we expect to see on-highway diesel PM emission reductions of over 90 percent.

We then consider whether there are additional air toxics controls that should be put in place at this time to further reduce on-highway MSAT inventories. With regard to fuels-based controls, we are proposing a gasoline benzene control program that requires refiners to maintain the current levels of over-compliance with RFG and anti-dumping toxics requirements. Because the proposed standard for each refinery is the same as the 1998-1999 average gasoline benzene level for that refinery, EPA currently anticipates that the proposed standards would impose only negligible costs, if any. With regard to additional vehicle-based controls, we conclude that it is not appropriate at this time to propose more stringent standards than the technology forcing standards found in our recently adopted Tier 2 and recently proposed HD2007 rule standards.

Finally, because of our concern about the potential future health impacts of exposure to the public of air toxics from the remaining emissions from mobile sources in the future, including emissions from nonroad equipment and fuels, we propose to continue our toxics-related research activities, in conjunction with other activities

currently being conducted by the Agency. These include our National Air Toxics Activities (NATA) and the National Air Toxics Program: The Integrated Urban Strategy (UATS). Under this strategy, EPA will continue to improve our understanding of emissions inventories, assessments of exposure, and the need for and appropriateness of additional mobile source air toxics controls for on-highway and nonroad sources. Based on the information developed through this research, EPA is proposing to conduct a future rulemaking to evaluate whether such additional mobile source air toxic controls should be adopted. This rulemaking would be completed no later than 2004.

**DATES:**

*Comments:* We must receive your written comments on this notice by September 20, 2000.

*Hearings:* We will hold a public hearing on August 21, 2000, at the Crowne Plaza Detroit-Metro Airport Hotel, 8000 Merriman Road, Romulus, Michigan 48174. The hearing will begin at 10:00 am and will continue until all testifiers have spoken.

**ADDRESSES:**

*Comments:* You may send written comments in paper form and/or by e-mail. We must receive them by the date indicated under "DATES" above. Send paper and/or e-mail copies of written comments (in duplicate if possible) to the contact person listed below.

EPA's Air Docket makes materials related to this rulemaking available for review in Public Docket No. A-2000-12 at the following address: U.S. Environmental Protection Agency (EPA), Air Docket (6102), Room M-1500 (on the ground floor in Waterside Mall), 401 M Street, S.W., Washington, D.C. 20460 between 8:00 a.m. to 5:30 p.m., Monday through Friday, except on government holidays. You can reach the Air Docket by telephone at (202) 260-7548, and by facsimile (202) 260-4400. We may charge a reasonable fee for copying docket materials, as provided in 40 CFR Part 2.

*Hearings:* We will hold a public hearing on August 21, 2000, at the Crowne Plaza Detroit-Metro Airport Hotel, 8000 Merriman Road, Romulus, Michigan 48174. We request that parties who want to testify at a hearing notify the contact person listed below ten days before the date of the hearing. Please see Section IX, "Public Participation" below for more information on the comment procedure and public hearings.

**FOR FURTHER INFORMATION CONTACT:** Carol Connell, U.S. EPA, National Vehicle and Fuels Emission Laboratory, 2000 Traverwood, Ann Arbor, MI 48105; Telephone (734) 214-4349; FAX: (734) 214-4816; E-mail: [connell.carol@epa.gov](mailto:connell.carol@epa.gov)

**SUPPLEMENTARY INFORMATION:**

Regulated Entities

This proposed action would affect you if you produce new motor vehicles, alter

individual imported motor vehicles to address U.S. regulation, or convert motor vehicles to use alternative fuels. It would also affect you if you produce, distribute, or sell gasoline motor fuel.

The table below gives some examples of entities that may have to follow the proposed regulations. But because these are only examples, you should carefully examine the proposed and existing regulations in 40 CFR parts 80 and 86. If you have questions, call the person listed in the “FOR FURTHER INFORMATION CONTACT” section above.

<b>Category</b>	<b>NAICS Codes (1)</b>	<b>SIC Codes (2)</b>	<b>Examples of Potentially Regulated Entities</b>
Industry	336111 336112 336120	3711	Motor Vehicle Manufacturers
Industry	336311 336312 422720 454312 811198 541514 541690	3592 3714 5172 5984 7549 8742 8931	Alternative Fuel Vehicle Converters
Industry	811112 811198 541514	7533 7549 8742	Commercial Importers of Vehicles and Vehicle Components
Industry	324110	2911	Petroleum Refiners
Industry	422710 422720	5171 5172	Gasoline Marketers and Distributors
Industry	484220 484230	4212 4213	Gasoline Carriers

(1) North American Industry Classification System (NAICS)

(2) Standard Industrial Classification (SIC) system code.

Access to Rulemaking Documents through the Internet:

Today's notice is available electronically on the day of publication from the Office of the Federal Register Internet Web site listed below. Electronic copies of the preamble, regulatory language and other documents associated with today's proposal are available from the EPA Office of Transportation and Air Quality Web site listed below shortly after the rule is signed by the Administrator. This service is free of charge, except any cost that you already incur for Internet connectivity.

**Federal Register Web Site:**

<http://www.epa.gov/docs/fedrgstr/epa-air/>

(Either select a desired date or use the Search feature.)

**Office of Transportation and Air Quality (OTAQ) Web Site:**

<http://www.epa.gov/otaq>

(Look in "What's New" or under the specific rulemaking topic.)

Please note that due to differences between the software used to develop the document and the software into which the document may be downloaded, changes in format, page length, etc., may occur.

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## **X. Statutory Provisions and Legal Authority**

### **I. Introduction**

#### **A. Background**

The 1990 Clean Air Act Amendments provide a key part of the foundation for our current national air toxics program. The Act provides a statutory framework designed to characterize, prioritize, and address the serious impacts of hazardous air pollutants (HAPs) on the public health and the environment through a strategic combination of regulatory approaches, partnerships, ongoing research and assessments, risk initiatives, and education and outreach.

Since 1990, our national air toxics control program for stationary sources has consisted primarily of technology-based emissions standards to reduce emissions of toxic air pollutants from major stationary sources, as required in section 112(d) of the Act. These actions have resulted, or are projected to result, in substantial reductions in HAP emissions.

Mobile source regulatory actions have also resulted in significant reductions of air toxics since 1990. In general, these mobile source air toxic reductions have been achieved through the implementation of controls put in place primarily to achieve attainment of the National Ambient Air Quality Standards (NAAQS) for ozone, particulate matter (PM), and carbon monoxide (CO). For example, hydrocarbon controls for motor vehicles to reduce ozone formation also reduce emissions of gaseous air toxics such as benzene, 1,3-butadiene, and formaldehyde. Mobile source PM controls on diesel engines have considerably reduced diesel exhaust emissions as well. Additional toxics reductions have been achieved through fuel controls, including the federal reformulated gasoline (RFG) program, and through refiner over-compliance with toxics requirements of our RFG and conventional gasoline programs.

Today's proposal takes our mobile source toxics control program a step further by considering more specifically the contribution mobile sources make to national inventories of specific air toxics and by evaluating the appropriateness of setting additional standards to reduce contributions from on-highway vehicles. In performing our analysis of additional controls, we will follow the requirements specified in Section 202(l)(2) of the Act: these motor vehicle or motor fuel standards must "reflect the greatest degree of emission reduction achievable through the application of technology which will be available, taking into consideration the standards established under [section 202(a)], the availability and costs of the technology, and noise, energy, and safety factors, and lead time." Our program is also consistent with the National Air Toxics Program: The Integrated Urban Strategy (also called the Urban Air Toxics Strategy, or UATS) published July 19, 1999 (64 FR 137, 38706).

With this background, we now turn to an overview of today's proposal. Section I of this preamble will give you a brief overview of our proposal and the rationale for proposing it. Subsequent sections expand on the identification of mobile source air toxics (MSATs), the impact of current and proposed motor vehicle emission control programs on MSAT emissions, and the evaluation of additional control programs for motor vehicles and their fuels. Additional sections deal with the contribution of nonroad

engines to MSAT inventories and our plan to continue to evaluate MSAT emissions and evaluate the appropriateness of setting additional air toxics control standards in the future. The final sections deal with several subjects, including opportunities for public participation.

## **B. Brief Overview of Air Toxics**

Before proceeding to a summary of today's action, we want to provide a brief overview of air toxics: what they are, their general health and environmental effects, and their sources. Today's action addressing motor vehicle air toxics occurs in the context of extensive earlier air toxics work, primarily relating to stationary sources of these pollutants. These topics are discussed in more detail later in this proposal and in the draft TSD.

- What are air toxics?

Air toxics, which are also known as "hazardous air pollutants" or HAPs, are those pollutants known or suspected to cause cancer or other serious health or environmental effects. They include pollutants like benzene found in gasoline, perchloroethylene emitted from dry cleaners, methylene chloride used as an industrial solvent, heavy metals like mercury and lead, polychlorinated biphenyls (PCBs), dioxins and some pesticides. While the harmful effects of air toxics are of particular concern in areas closest to where they are emitted, they can also be transported and affect other geographic areas. Some can persist for considerable time in the environment and/or bioaccumulate in the food chain.

- What are the sources of air toxics?

There are literally millions of sources of air toxics, including: major stationary sources<sup>1</sup> such as large industrial complexes like chemical plants, oil refineries and steel mills; small (area) stationary sources<sup>2</sup> such as dry cleaners, gas stations, and small manufacturers; and mobile sources such as cars, trucks, buses, and nonroad vehicles such as construction and farm equipment.

- What health and environmental effects do air toxics cause?

Hazardous air pollutants can cause many ill health effects. Many of these substances are known or suspected to be human carcinogens. Some of these chemicals are known to have negative effects on people's respiratory, neurological, immune, or reproductive systems. Some chemicals pose particular hazards to people with preexisting illnesses, or those of a certain age or stage in life, such as children or the elderly.

- What are mobile source air toxics?

We use the term "mobile source air toxics," or "MSATs," to signify those air toxics are emitted by nonroad engines and motor vehicles. Section 202(l) of the Act, which addresses controls for hazardous air pollutants from motor vehicles and motor vehicle fuels, does not specify which pollutants are to be evaluated as air toxics, other than benzene, formaldehyde, and 1,3-butadiene. As a result, the first thing a mobile

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<sup>1</sup>Major stationary sources are sources that emit, or have the potential to emit, 10 tons per year or more of any one HAP or 25 tons per year or more of a combination of HAPs.

<sup>2</sup>Area sources are those stationary sources that are not major sources.



source air toxics control program must do is develop a list of compounds to be addressed. Using the methodology described in Section II of this proposal, we have identified 21 mobile source air toxics (MSATs), listed in Table I-1 below.

Of our 21 MSATs, thirteen (those marked with an asterisk in Table I-2) are also included on the list of urban HAPs for the Urban Air Toxics Strategy (see below). Of the remainder, all but one are specifically identified in the CAA Section 112(b) HAP list. Diesel exhaust is not included in these other two lists because this pollutant was not included by Congress in the Section 112(b) HAP list and, consequently, was not included in the group of pollutants that were considered for inclusion in the urban HAP list. It is, however, a pollutant that we identified in the UATS as a concern in urban areas.

Table I-1  
List of Mobile Source Air Toxics (MSATs)

Acetaldehyde*	Diesel Exhaust	MTBE
Acrolein*	Ethylbenzene	Naphthalene
Arsenic compounds*	Formaldehyde*	Nickel compounds*
Benzene*	n-Hexane	POM (Sum of 7 PAHs)*
1,3-Butadiene*	Lead compounds*	Styrene
Chromium compounds*	Manganese compounds*	Toluene
Dioxin/Furans*	Mercury compounds*	Xylene

\*Also on the list of urban HAPs for the Urban Air Toxics Strategy

- How are air toxics from mobile sources formed?

Mobile source air toxics come from four sources. First, some air toxics are present in fuel and are emitted to the air when it evaporates or passes through the engine as unburned fuel. Benzene, for example, is a component of gasoline. Cars emit small quantities of benzene in unburned fuel, or as vapor when gasoline evaporates. Second, mobile source air toxics are formed through engine combustion processes. A significant amount of automotive benzene comes from the incomplete combustion of compounds in gasoline such as toluene and xylene that are chemically very similar to benzene. Like benzene itself, these compounds occur naturally in petroleum and become more concentrated when petroleum is refined to produce high octane gasoline. Diesel exhaust emissions, as well as formaldehyde, acetaldehyde, and 1,3-butadiene, are also by-products of incomplete combustion. Third, some compounds, like formaldehyde and acetaldehyde, are also formed through a secondary process when other mobile source pollutants undergo chemical reactions in the atmosphere. Finally, metal air toxics result from engine wear or from impurities in oil or gasoline. They can also be present in fuel additives.

- What are the Urban HAPs?

The urban HAPs are the 33 compounds that have been identified by the Agency in

the Urban Air Toxics Strategy (UATS)<sup>3</sup> as those HAPs posing the greatest threat to human health in the largest number of urban areas. These compounds are a subset of the 188 compounds listed in Section 112(b) of the Clean Air Act. The 33 urban HAPs are as follows:

Table I-2  
List of Urban HAPs for the Urban Air Toxics Strategy

Acetaldehyde	Coke oven emissions	Mercury compounds
Acrolein	1,2-dibromomethane	Methylene chloride (dichloromethane)
Acrylonitrile	1,2-dichloropropane (propylene dichloride)	Nickel compounds
Arsenic compounds	1,3-dichloropropene	Polychlorinated biphenyls (PCBs)
Benzene	Ethyl dichloride (1,2-dichloroethane)	Polycyclic organic matter (POM)
Beryllium compounds	Ethylene oxide	Quinoline
1,3-Butadiene	Formaldehyde	1,2,7,8-tetrachlorodibenzo-p-dioxine (and congeners and TCDF congeners)
Cadmium compounds	Hexachlorobenzene	1,2,2,2-tetrachloroethane
Carbon tetrachloride	Hydrazine	Tetrachloroethylene (perchloroethylene)
Chloroform	Lead compounds	Trichloroethylene
Chromium compounds	Manganese compounds	Vinyl chloride

### C. Basic Components of Today's Proposal

Many motor vehicle and fuel emission control programs of the past have reduced air toxics. EPA has recently created or proposed several programs that further reduce air toxics emissions from a wide variety of mobile sources. These include our reformulated gasoline (RFG) program, which has substantially reduced mobile source air toxics in certain areas of the country, our national low emission vehicle (NLEV) program, our Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and our

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<sup>3</sup>National Air Toxics Program: The Integrated Urban Strategy; Notice (64 FR 137, pp. 38706-38740 (19 July 1999)).

recently proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. In addition, certain other mobile source control programs have been specifically aimed at reducing toxics emissions (i.e., our lead phase-out programs).

While these mobile source standards were put in place primarily to reduce ozone and particulate matter inventories through VOC and diesel PM controls, and thereby to help states and localities come into attainment with the National Ambient Air Quality Standards (NAAQS), they have reduced and will continue to reduce on-highway emissions of gaseous air toxics very significantly.<sup>4</sup> By 2020, these programs are expected to reduce 1990 levels of on-highway emissions of benzene by 75 percent, formaldehyde by 87 percent, 1,3-butadiene by 75 percent, and acetaldehyde by 82 percent.

In addition, we have issued or proposed regulations to control diesel particulate matter (diesel PM) emissions from mobile sources, including the recent light- and heavy-duty vehicle programs mentioned above. By 2020, we expect to see on-highway diesel PM emission reductions of 94 percent from 1990 levels.

Nevertheless, there is a continuing public health concern about the ambient levels of several key air toxics. Today's proposal therefore contains a plan to address mobile sources of these air toxics. We begin by considering the different kinds of emissions from motor vehicles and identifying a list of compounds that should be considered Mobile Source Air Toxics (MSATs). We then evaluate the effectiveness of current and proposed controls in reducing on-highway emissions of these MSATs. We then consider whether there are additional air toxics controls that should be put in place at this time to reduce on-highway MSAT inventories even more. Based on this assessment, we are proposing standards that will require individual refiners to maintain their current gasoline benzene content levels. Finally, we describe a process to conduct research and analysis to continue to assess the need for and feasibility of additional mobile source air toxics controls. We are proposing to conduct another rulemaking to be completed by December, 2004, based on the additional research and analysis we conduct and any additional information that becomes available in that timeframe. That future rulemaking would re-evaluate the various decisions on motor vehicle and fuel air toxics controls made in this rulemaking.

#### 1. Identification of Mobile Source Air Toxics

There are hundreds of different compounds and elements that are known to be emitted from passenger cars, on-highway trucks, and various types of nonroad equipment. Today's action identifies a list of pollutants known to be emitted from motor vehicles or their fuels and considered by EPA to pose potential adverse human health risks. This list is not intended to be a fixed one; additional compounds may be added to the list, in a future rulemaking, as we learn more about the pollutants emitted from mobile sources and the health effects of those pollutants. Similarly, compounds may be removed from the

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<sup>4</sup>Included among the numerous chemicals that make up total VOC emissions – that thus are reduced when VOCs are reduced – are several gaseous toxics (e.g., benzene, formaldehyde, 1,3-butadiene, and acetaldehyde).

list if new information on the pollutants emitted by mobile sources or their health effects supports a different conclusion. Based on the available data, we are proposing a list of 21 mobile source air toxics (MSATs). We are requesting comment both on the list we have developed and on our approach to developing that list.

2. Assessment of Emission Benefits from Current Standards

Once we identified the MSATs, we were able to assess the impact that current and future mobile source controls will have on national emissions inventories of these pollutants. Today's action describes how our current mobile source emission control programs are expected to reduce these emissions. The very good news is that, by 2020, we expect existing programs like the reformulated gasoline (RFG) program, national low emission vehicle (NLEV) program, Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements (Tier 2), and our recently proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements (HD2007 rule), to significantly reduce on-highway emissions of key air toxics. Between 1990 and 2020, these programs are expected to reduce on-highway emissions of benzene by 75 percent, formaldehyde by 87 percent, 1,3-butadiene by 75 percent, and acetaldehyde by 82 percent. In addition, we expect to see on-highway diesel PM emission reductions of 94 percent.

3. Consideration of Additional Controls at this Time

Although we anticipate substantial reductions in emissions of key toxic pollutants by 2020, the serious health effects associated with many of these compounds lead us to evaluate whether additional controls are appropriate at this time. For the purpose of our analysis, we divide potential control measures into two broad categories: vehicle-based controls and fuel-based controls. Vehicle-based controls include programs that would reduce evaporative and exhaust emissions from vehicles and engines. Fuel-based controls explore how changing fuel formulation can reduce air toxic emissions.

The only toxics control program we are proposing today is fuel-based. Specifically, we are proposing to require refiners and importers to maintain the gasoline benzene content of the fuel they produce or import at the current benzene levels of such gasoline for the foreseeable future. We are also seeking comment on whether additional volumes of gasoline produced above the volumes produced in a baseline year should be subject to a different benzene standard. The overall goal of this program is to ensure that benzene emissions due to gasoline fuel benzene do not increase above current emission levels. The details of this program are discussed in Section V below, as well as the various vehicle and fuel controls EPA has considered.

With regard to vehicle-based air toxics controls, EPA believes that it is not appropriate at this time to propose additional motor vehicle or fuel based controls under Section 202 (l)(2), beyond the controls currently adopted or proposed by the Agency. This is based on consideration of the technical feasibility, cost, and other factors relevant to a proposal of further controls at this time. EPA is also proposing a regulatory provision providing for a future rulemaking that would determine, based on the information available at that time, whether additional motor vehicle or fuel controls would be appropriate under section 202 (l)(2) to control emissions of hazardous air

pollutants from motor vehicles and their fuels. Finally, the rulemaking would consider the contribution of nonroad engines to emissions of air toxics and whether controls that reduce these emissions along with motor vehicle emissions are appropriate under the Act.

#### 4. Technical Analysis Plan and Future Rulemaking

We believe our evaluation to date of the need for, and appropriateness of, additional mobile source toxics control measures provides adequate support for today's proposal. At this time, EPA is also engaged in other toxics-related research activities through the NATA activities and the UATS described below. This emerging information will help us in further evaluating potential additional mobile source air toxics controls in the future.

In light of this ongoing work, we are proposing to conduct a Technical Analysis Plan as described in Section VII below. This Plan would coordinate work within the Agency in several key areas, including development of emission factors for nonroad sources, analysis of toxics exposures in microenvironments, and examination of additional fuel- and vehicle-based air toxics controls for both motor vehicles and engines and nonroad engines. This work would be fully coordinated with the new work with NATA and the UATS. This will allow us to take full advantage of what is collectively learned and provide a solid basis for future rulemaking. The results of this research and analysis would form the basis of a future rulemaking, as discussed below.

#### 5. Nonroad Air Toxics

While section 202(l)(2) of the Act specifies that we set standards to control hazardous air pollutants from motor vehicles and motor vehicle fuels, we believe it is also necessary to discuss nonroad sources in today's proposal, making it a comprehensive mobile source air toxics program, for two important reasons. First, today's proposal is intended to be a companion piece to EPA's Urban Air Toxics Strategy. As described above, the Urban Air Toxics Strategy is intended to address air toxics inventories in urban areas. Because both on-highway and nonroad engines contribute to those inventories, it is important to address both categories in a comprehensive strategy to reduce urban air toxics. Second, currently available data suggests that nonroad sources contribute approximately the same amount to national inventories of key air toxics as on-highway sources. Therefore, a comprehensive control strategy must include nonroad sources. Section 213 of the Act allows us to control emissions from those classes or categories of new nonroad engines that cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. To the extent emissions of MSAT from these engines is found to cause or contribute to air pollution problems, EPA may decide to adopt further nonroad controls in the future, as specified in section 213 of the Act.

At the same time, while we are including nonroad sources in our discussions of inventory impacts and expected reductions from current nonroad emission control strategies, we are not proposing new emission control standards for these engines in this proposal. This is because we are lacking relevant data that are required to assess the appropriateness of additional MSAT controls. These include speciation data for some categories of nonroad engines, geographic dispersion of emissions, and information,

including cost information, about technologies that can reduce these emissions further. Our Technical Analysis Plan, described below, would help us obtain the data we need to consider and in the future evaluate whether additional nonroad air toxics controls are needed and appropriate.

#### **D. EPA's Statutory Authority for Proposing Today's Action**

We are proposing today's action under the authority of Section 202(l) of the Clean Air Act. The gasoline benzene standards in today's action are proposed under Section 211(c) of the Clean Air Act.

Section 202(l) of the Act consists of two parts. Section 202(l)(1) calls on EPA to study the need for and feasibility of controlling toxic air pollutants associated with motor vehicles and motor vehicle fuels. That study is to focus on those categories of emissions that pose the greatest risk to human health or about which significant uncertainties remain. The Act specifies that, at a minimum, the study focus on emissions of benzene, formaldehyde, and 1,3-butadiene.

Section 202(l)(2) instructs us to set standards to control hazardous air pollutants from motor vehicles, motor vehicle fuels, or both. These standards, which may be revised from time to time, are to reflect the greatest degree of emission reduction achievable through the application of technology which will be available, taking into consideration the motor vehicle standards established under Section 202(a) of the Act, the availability and cost of the technology, and noise, energy and safety factors, and lead time. The regulations are to apply, at a minimum, to benzene and formaldehyde emissions.

We completed the study required under Section 202(l)(1) in April 1993. The report, entitled "Motor Vehicle-Related Air Toxics Study," is available on our website (<http://www.epa.gov/otaq/toxics.htm>). Specific pollutants or pollutant categories discussed in this report include benzene, formaldehyde, 1,3-butadiene, acetaldehyde, diesel particulate, gasoline particulate, gasoline vapors, and selected metals. The emissions and exposure aspects of this report were recently updated in November 1999 for several of the air toxics covered in the 1993 study. That report, entitled "Analysis of the Impacts of Control Programs on Motor Vehicle Toxics Emissions and Exposure in Urban Areas and Nationwide," is also available on our website, and is described in more detail in Section I.E., below. We sought peer review comments on both the 1993 and 1999 studies. We considered the 1993 comments in developing the 1999 document and will consider the 1999 comments in developing our future activities (e.g., in the development of version 4 of the Hazardous Air Pollutant Exposure Model, HAPEM4).

Today's action is pursuant to Section 202(l)(2). In this action, we identify a list of MSATs and discuss the impacts of existing mobile source emission control programs on their emissions. In a separate rulemaking, the HD2007 rule, we are proposing stringent emission standards that would lead to significant reductions of the gaseous and PM components in diesel exhaust emissions. In today's proposal, we are proposing standards to maintain the benzene content of gasoline fuel at 1998-1999 levels for volumes produced in that time period. We are also seeking comment on whether additional volumes of gasoline produced above the volumes produced in a baseline year should be

subject to a different benzene standard.

Today's proposal is based on all the information EPA has available at this time. EPA recognizes that there are various gaps in the data, and that further analysis and evaluation would be useful in evaluating the appropriateness of and need for additional future controls on motor vehicles or their fuels. Given the important contribution of mobile sources to the national inventory of air toxics, we are proposing a plan to conduct this additional work in the near future. The results of this additional research would form the basis for a future rulemaking to re-evaluate the question of whether additional controls on motor vehicles and nonroad engines or their fuels are appropriate under the Act based on all of the information available to the Agency at that time.

#### **E. Motor Vehicle Air Toxics Studies**

In 1993, EPA released a study of motor vehicle-related air toxics in compliance with Section 202(l)(1) of the Clean Air Act.<sup>5</sup> The study provided estimates of motor vehicle emissions of several pollutants believed to pose the greatest risk to public health. Using these estimates of emissions, the study modeled the exposure and risk attributable to motor vehicle emissions and projected emissions, exposures, and risk for the year 2010.

Peer review of this study was completed in 1994.<sup>6</sup> The comments from the peer review included suggestions for improving EPA's exposure modeling and risk assessment methodology. In response to these comments, EPA updated its exposure model for motor vehicle-related air toxics. Also, since 1993, significant new information on vehicle emission rates has been developed as part of the Auto/Oil program, the development of the Complex Model for reformulated gasoline, CARB test programs, and other sources, and much more is known about the impact of fuel properties on toxic emissions. Furthermore, EPA has developed new programs, such as the NLEV and Tier 2 standards, which have significant effects on projections of toxic emissions and exposure. Finally, EPA has released an updated cancer risk assessment for benzene, a draft reassessment for

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<sup>5</sup>EPA, 1993. Motor Vehicle-Related Air Toxics Study. Report No. EPA 420-R-93-005. This report can be accessed at <http://www.epa.gov/otaq/toxics.htm>.

<sup>6</sup>Peer review comments on the 1993 study can be accessed at <http://www.epa.gov/otaq/toxics.htm>

1,3-butadiene, and a draft assessment for diesel exhaust emissions.<sup>7, 8, 9</sup>

In light of all of this new information that has been developed since 1993, and in response to peer review comments, EPA has updated the estimates of emissions and exposure contained in the 1993 study.<sup>10</sup> The Agency is making further efforts to improve its understanding of toxic emissions, exposure, and risk associated with on-highway vehicles, nonroad equipment, and other sources as part of the National Air Toxics Assessment (NATA) process discussed below.

In the above air toxics studies, there are limitations in how ranges of exposures are modeled or characterized. For instance, the screening models the Agency has used do not consider ‘hotspots’ for elevated air toxics concentrations. For this reason, EPA has not been able to conduct a complete exposure assessment. The Agency also needs to do more work on considering the costs and performance levels of pollution controls on air toxics. These activities would be included in the proposed Technical Analysis Plan discussed later in this preamble.

#### **F. Other Air Toxics Activities**

As we developed and prepared today’s mobile source air toxics program, we worked in the context of two other important activities that are ongoing at the Agency. These are EPA’s Integrated Urban Air Toxics Strategy (UATS) development and the National Air Toxics Assessment (NATA) activities. Because these two programs are also important parts of our efforts to reduce toxic emissions from all sources, this section contains a brief summary of their key components. Interested readers are encouraged to visit EPA’s Toxics website for more information about these programs ([www.epa.gov/otaq/toxics.htm](http://www.epa.gov/otaq/toxics.htm)).

##### **1. Integrated Urban Air Toxics Strategy**

EPA’s Urban Air Toxics Strategy (the UATS) focuses on reducing the human health threats of air toxics in urban areas. In urban areas, toxic air pollutants raise special concerns because sources of emissions and people are concentrated in the same

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<sup>7</sup>EPA 1998. Environmental Protection Agency, Carcinogenic Effects of Benzene: An Update, National Center for Environmental Assessment, Washington, DC. 1998. This report can be accessed at <http://www.epa.gov/ncea/benzene.htm>.

<sup>8</sup>EPA 1998. Environmental Protection Agency, Health Risk Assessment of 1,3-Butadiene. EPA/600/P-98/001A, February 1998. This report can be accessed at <http://www.epa.gov/ncea/butadiene.htm>

<sup>9</sup>EPA. 1999. Health Assessment Document for Diesel Emissions: SAB Review Draft. EPA/600/8-90/057D Office of Research and Development, Washington, D.C. The document is available electronically at [www.epa.gov/ncea/diesel.htm](http://www.epa.gov/ncea/diesel.htm).

<sup>10</sup>Analysis of the Impacts of Control Programs on Motor Vehicles Toxics Emissions and Exposure in Urban Areas and Nationwide (Volumes 1 and 2), November 1999. EPA420-R-99-029/030



geographic areas, leading to large numbers of people being exposed to the emissions of many HAPs from many sources. In the UATS, EPA outlines future actions that we plan to take to reduce emissions of air toxics and improve our understanding of the health threats posed by air toxics in urban areas. The over-arching goal for the UATS is to reduce cancer and noncancer risks associated with air toxics in urban areas. Also, because air toxics in urban areas may threaten the health of some people more than others, depending on factors such as where they live in relation to toxic sources, we intend to characterize exposure and risk distributions both geographically and demographically. This will include particular emphasis on highly exposed individuals (such as those in geographic hot spots) and specific population subgroups (e.g., children, the elderly, and low-income communities).

The overall UATS goals are: (1) to reduce by 75 percent from 1990 levels the risk of cancer associated with air toxics from stationary sources (both large and small commercial and industrial sources); (2) to substantially reduce the noncancer health effects (e.g., birth defects and reproductive effects) associated with air toxics from small commercial and industrial sources; and (3) to address disproportionate impacts in certain areas (e.g., highly-exposed individuals in toxics “hot spots”) or experienced by certain populations (e.g., children, the elderly, or minority and low-income communities).

As a first step in the UATS, EPA identified 33 of the 188 Section 112(b) toxic air pollutants that EPA concluded pose the greatest threat to public health in the largest number of urban areas (see Table I-2, above). It should be noted that while diesel exhaust emissions are not included as a specific pollutant in the list of 33 urban HAPs, many of the hazardous constituents of diesel exhaust emissions are included among them, and it is a pollutant that we identified in the UATS as a concern in urban areas.

The UATS outlines several steps that EPA will take to reduce urban air toxics and address risks, and as a part of the UATS, EPA has prepared an Action Plan. The key components of the Action Plan are as follows.

- Achieve reductions through regulatory actions and related projects. The strategy presents a framework for reducing air toxic emissions from all types of sources found in urban areas, including mobile sources, major industrial sources, and smaller stationary sources. Today’s proposal contains mobile source-specific toxics regulations. We are also developing programs to reduce emissions from several area source categories (i.e., smaller commercial and industrial operations), and plan to complete regulations to address the new 13 sources identified in the UATS by 2004. Regulations are already under development or exist for the 16 other area source categories listed in the UATS.
- Collaborate with interested parties. We are working with state, local, and tribal agencies, environmental groups, environmental justice communities, and affected industries, including small businesses, to assure that any actions under the UATS are responsive to health concerns while promoting fairness, encouraging urban redevelopment, and minimizing regulatory burdens.

- Education and outreach efforts. We will make an effort to inform stakeholders about the UATS and get their input into designing programs to implement it.

## 2. National Air Toxics Assessment

National Air Toxics Assessment (NATA) activities are an important component of the UATS and EPA's overall goal of reducing exposure to air toxics. These assessment activities include air toxics monitoring, emissions inventory development, exposure modeling, research activities, and risk assessment. Over time, these activities will help us set program priorities, characterize risks, and track progress toward reducing exposure to air toxics. Specifically, our current NATA activities include expanding air toxics monitoring, improving and periodically updating emissions inventories, periodically conducting national- and local-scale air quality, multimedia and exposure modeling, characterizing risks associated with air toxics exposures, and continued research on health and environmental effects and exposures to both ambient and indoor sources of air toxics.

As part of these NATA activities, EPA is now conducting an initial national screening-level assessment to demonstrate our approach to characterizing air toxics risks nationwide. This initial screening-level assessment will help to characterize the potential health risks associated with inhalation exposures to the 33 urban HAPs and diesel exhaust emissions.<sup>11</sup> While such a broad-scale assessment is necessarily limited in the scope of the risks that it can assess quantitatively, and by the uncertainties inherent in the various types of data and methods currently available, it represents an important step in characterizing air toxics risks nationwide. Our initial national, screening-level air toxics assessment includes four major steps:

- Compiling a national emissions inventory of 1996 air toxics emissions from outdoor sources of air toxics emissions.
- Estimating 1996 air toxics ambient concentrations across the continental United States (and Puerto Rico and the Virgin Islands) for the 33 urban HAPs and diesel PM.
  - Model evaluation comparing ambient concentrations with available monitored values.
- Estimating 1996 population exposures across the continental United States (and Puerto Rico and the Virgin Islands) to the 33 urban HAPs and diesel PM.
- Characterizing potential public health risks due to inhalation of these 33 urban HAPs.

In describing what NATA will include, it is also important to note the potentially important sources and pathways of risks to public health that are beyond the scope of this quantitative assessment. For example, while we recognize that indoor sources of air toxics emissions likely contribute substantially to the total exposures that people experience for a number of these HAPs, assessing these indoor sources of exposure

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<sup>11</sup>For an explanation of the connection between diesel exhaust, which is one of our MSATs, and diesel PM, see Section II.F.

cannot be done on a national scale at this time. Further, for a subset of these HAPs (i.e., those that persist and bioaccumulate in the environment), dietary exposures (e.g., eating contaminated fish) likely contribute much more to the total risk associated with exposure to these pollutants than do the inhalation exposures that will be addressed in this assessment. These and other important aspects of total population exposures to air toxics will be addressed more fully over time as part of our NATA activities as more comprehensive data and assessment tools become available.

Additionally, NATA activities include other key activities that will support further risk characterizations on the local and national level in the future. These include:

- Developing and implementing a plan to characterize the concentrations of ambient air toxics through an expanded monitoring network. Data from existing state and local air monitoring programs will be compiled to summarize our current knowledge about ambient concentrations of air toxics. Existing ambient air toxics monitoring data will be compiled and summarized and then used as a "reality check" on model output.
- Improving existing monitoring networks, guided by data analysis and model predictions, to improve the collection of ambient concentration data for future model evaluations. As the monitoring program matures, trend sites will be established to assess the effectiveness of all of our air toxics control programs.
- Evaluating air toxics on a more local scale (e.g., an urban area) using more refined air quality modeling tools that factor in specific local information such as terrain (e.g., mountainous or flat) and local weather patterns. The results of national and local-scale modeling can be compared to provide a more complete context for the evaluation of air toxics.
- Comparing air toxics inventories from 1990 and 1996 on a toxicity-weighted basis to help inform future assessments of progress toward meeting the risk reduction goals.
- Recommending tools to state, local and tribal regulatory agencies for evaluating air toxics concentrations, exposures and risk. This will include a comparison of the results from national-scale models to those from more local-scale models.

While there continue to be significant uncertainties and gaps in methods, models, and data that limit our ability to assess risks to public health and the environment associated with exposures to air toxics, continued research will enable future assessment activities, both at the national screening-level and at more local refined levels, to yield improved assessments of cumulative air toxics risks.

## **II. What Are the Mobile Source Air Toxics?**

### **A. Introduction**

There are hundreds of different compounds and elements that are known to be emitted from passenger cars, on-highway trucks, and various nonroad equipment. Several of these compounds may have adverse effects on human health and welfare. In

recognition of this fact, Congress instructed EPA, in Section 202(l)(2) of the Act, to set emission control standards for hazardous air pollutants from motor vehicles and their fuels. Except for benzene and formaldehyde (specifically mentioned in 202(l)(2)), the Act does not specify the compounds that should be included in such a control program. Therefore, the first step in developing a mobile source air toxics control program is to identify the compounds that should be treated as hazardous air pollutants for purpose of Section 202(l)(2). Since EPA data suggests that nonroad engines and vehicles emit the same pollutants, EPA will identify this list as a list of mobile source air toxics (MSATs).<sup>12</sup> EPA has used the methodology described below to develop this list of MSATs.

#### **B. The Methodology Used to Identify our List of Mobile Source Air Toxics**

EPA developed the list of MSATs by first compiling all available recent (i.e., less than 10 years old) studies which speciated emissions from motor vehicles and their fuels. We then compared the list of compounds in EPA's Integrated Risk Information System (IRIS) database to the speciated lists of compounds in these studies. IRIS is a database of compounds that identifies EPA's consensus scientific judgment on the characterization of the potential adverse health effects that may result from a lifetime or acute exposure to various substance. IRIS may also indicate that based on the current data a compound can be found to have "evidence of noncarcinogenicity" i.e., the compound does not cause cancer.

By comparing the list of compounds in IRIS to these emission speciation studies, we generated a list of 21 compounds. An evaluation of the potential for adverse health effects reflected in IRIS and in the ongoing agency scientific assessments of these compounds indicates that the potential for adverse health effects from exposure to these compounds warrants inclusion as a MSAT.

It is important to note that inclusion on the list is not itself a determination by EPA that emissions of the compound in fact present a risk to public health or welfare, or that it is appropriate to adopt controls to limit the emissions of such a compound from motor vehicles or their fuels. The purpose of the list is more as a screening tool - it identifies those compounds emitted from motor vehicles or their fuels, and where the available information about their potential for adverse health or welfare effects indicates that further evaluation of emissions controls is appropriate. In conducting any such further evaluation, pursuant to sections 202(a) or 211(c) of the Act, EPA would consider whether emissions of the compound cause or contribute to air pollution which may reasonably be anticipated to endanger the public health or welfare. Such an evaluation would also consider the appropriate level of any controls, based on the criteria established in section 202(l)(2). Inclusion of a compound on the MSAT list does not decide these issues, but instead identifies those compounds for which such an evaluation would appear

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<sup>12</sup>We have chosen to call our list of toxics a mobile sources list to acknowledge that nonroad sources may also contribute emissions of these pollutants. For purposes of Section 202(l)(2), each of the MSATs would be considered a "hazardous air pollutant from motor vehicles and motor vehicle fuels."

to be warranted.

EPA also compared its universe of known compounds emitted from motor vehicles against other lists or sources of information on toxic substances, and did not identify any additional substance that we believe should be listed at this time. EPA believes this process allows for re-evaluation of the MSAT list in the future, as information is learned about additional compounds or new information is learned about the 21 compounds. Compounds may be added to or removed from the list in a rulemaking.

EPA invites comment on an alternative listing approach whereby any compound emitted from motor vehicles or their fuels that is listed under section 112(b) would be considered a MSAT. Additional compounds not on the section 112(b) list, such as diesel exhaust, would be considered a MSAT where EPA has sufficient scientific evidence, such as an EPA health assessment or similar analysis, indicating a potential for adverse effects on public health or welfare that would warrant inclusion on the list.

#### 1. Identifying Pollutants Emitted from Mobile Sources

In identifying a list of MSAT, EPA first compiled all available recent studies which speciated emissions from motor vehicles and their fuels. To do this, EPA reviewed a number of databases that contain information on the various species of compounds emitted from motor vehicles and their fuels. It is difficult to get a precise picture of these emissions due to the variety and number of databases in the literature. This is particularly true for hydrocarbon (HC) speciation databases. Most toxic air pollutants are hydrocarbons by their chemical nature and thus will be detected only if the HCs are chemically separated and identified (speciated). Many test programs that characterize vehicle emissions identify only total hydrocarbons (THC) without separating out the individual species of hydrocarbons and many use different test methods. The issue is further complicated by the limited availability of these databases for certain vehicle classes.

We have recent (less than ten years old) speciation profiles for emissions from light-duty gas vehicles (LDGV), heavy-duty diesel vehicles (HDDV), heavy-duty gasoline vehicles (HDGV), gasoline powered nonroad engines, and turbine engine aircraft.<sup>13</sup> Data for other vehicle and engine types (e.g., light-duty diesel engines and nonroad diesel engines) either do not exist or are outdated (more than 10 years old) and thus are judged not to be representative of current emissions. However, it is unlikely that the lack of recent data for these vehicle and engine types would result in the absence of compounds from the list, since the combustion process is similar to vehicle and engine types for which we do have data. Forty-four speciation studies were found that met this age criteria. All of these speciation profiles attempt to accomplish more or less the same objective: separating and identifying the compounds that comprise the hydrocarbon portion and particulate phase of mobile source emissions.

With regard to alternative-fueled vehicles, most of the compounds included in their exhaust are included on our list of MSATs (e.g., formaldehyde, acetaldehyde). It

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<sup>13</sup>See Appendix I, Chapter 2 of the TSD.

should be noted that, depending on their fuel, these vehicles may also emit unburned ethanol and methanol, which were not included in our speciation data.

Low level ethanol mixtures (10% ethanol and 90% gasoline) are widely used in the United States. Higher level ethanol mixtures (e.g., 85% ethanol) are used as alternative fuel sources in a small number of flexible fuel vehicles. However, there is a paucity of data on potential inhalation effects of ethanol, and the compound is not listed in IRIS. Thus it is not included on the list of MSATs. EPA requests comment on whether it should be included.

Methanol is also a promising alternative fuel for motor vehicles, and a small number of flexible fuel vehicles operate on a methanol mixture (e.g., 85% methanol). Inhalation of methanol at high concentrations (greater than 1000 ppm) has caused birth defects in rats and mice and at low levels can cause symptoms such as eye irritation, headaches, dizziness, and nausea. Methanol is highly toxic by oral exposure routes and is listed in IRIS. Because of the small numbers of vehicles using methanol currently in use, EPA requests comment on whether this compound should also be included in our MSAT list.

EPA requests comment on our list of compounds associated with motor vehicles and their fuels provided here.

## 2. Using IRIS to Identify Pollutants with Potential Adverse Health Effects

The Integrated Risk Information System (IRIS) is an EPA database of scientific information that contains the Agency consensus scientific positions on potential adverse health effects that may result from lifetime (chronic) or short-term (acute) exposure to various substances found in the environment.<sup>14</sup> IRIS currently provides health effects information on over 500 specific chemical compounds. The information contained in the IRIS database includes an EPA finding for each compound that: (1) there is a health hazard, either cancer or noncancer, associated with exposure to the compound, (2) the compound is noncarcinogenic based on current data, or (3) the data is insufficient to determine if the compound is a hazard.

IRIS contains chemical-specific summaries of qualitative and quantitative health information. IRIS information may include the reference dose (RfD) for noncancer health effects resulting from oral exposure, the reference concentration (RfC) for noncancer health effects resulting from inhalation exposure, and the carcinogen assessment for both oral and inhalation exposure. Combined with information on specific exposure situations, the summary health hazard information in IRIS may be used in evaluating potential public health risks from environmental contaminants.

Before a substance is listed on the IRIS database, it goes through a thorough scientific evaluation. This consensus and review process, managed by EPA's Office of Research and Development (ORD), consists of (1) an annual Federal Register announcement of the IRIS agenda and a call for scientific information from the public on the selected chemical substances, (2) a search of the current literature, (3) development of health assessment and draft IRIS summaries, (4) internal EPA peer review, (5) external

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<sup>14</sup>EPA IRIS Database, <http://www.epa.gov/ngispgm3/iris/index.html>

peer review, (6) Agency consensus review and management approval within EPA, (7) preparation of final IRIS summaries and supporting documents, and (8) entry of summaries and supporting documents into the IRIS database.

### **C. List of Mobile Source Air Toxics**

By comparing the list of compounds in IRIS to the motor vehicle emissions identified in the speciation studies, we identified 21 MSAT. This list is set out in Table II-1. Each of these pollutants are known, probable, or possible human carcinogens (Group A, B or C) or were considered by the Agency to pose a risk of adverse noncancer health effects.<sup>15</sup> EPA requests comment on the appropriateness of the compounds on the list of compounds associated with motor vehicles and their fuels provided here as well as the need to consider other hazardous or toxic air pollutants for inclusion on the list.

It is difficult to identify the specific form of metals being emitted in motor vehicle exhaust because the databases only report the total amount of metal compound identified. As a result, we have chosen to list the entire group of metal compounds if any compound of the metal has been detected in motor vehicle exhaust and any compound of the metal is listed in IRIS as potentially causing adverse human health effects. For example, if we assume most chromium (Cr) emissions for mobile sources are unidentified as to the species, we would present the emissions as total chromium and not attempt to allocate these emissions because of the lack of accurate metal speciation information in most cases. When we assess the range of potential health impacts associated with exposure to chromium compounds, we consider the health effects associated with each compound for which we have information. For chromium, the most toxic form in IRIS is Cr+6; hence the health impacts described for chromium compounds include these most serious effects even though it is highly unlikely that all motor vehicle emissions are Cr+6. EPA believes this listing approach is a reasonable, health-protective way to handle the uncertainty surrounding motor vehicle emissions of metals. We also recognize that this is not an appropriate methodology for assessing the actual health risks of the entire group of metal compounds emitted from motor vehicles.

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<sup>15</sup>A further discussion of the potential cancer and noncancer risks, and other dose-response information for each MSAT can be found in Chapter 3 of the TSD.

Table II-1  
Proposed List of Mobile Source Air Toxics (MSATs)

Acetaldehyde	Diesel Exhaust	MTBE***
Acrolein	Ethylbenzene	Naphthalene
Arsenic Compounds*	Formaldehyde	Nickel Compounds*
Benzene	n-Hexane	POM****
1,3-Butadiene	Lead Compounds*	Styrene
Chromium Compounds*	Manganese Compounds*	Toluene
Dioxin/Furans**	Mercury Compounds*	Xylene

\*Although the different species of the same metal differ in their toxicity, the onroad mobile source inventory contains emissions estimates for total compounds of the metal identified in particulate speciation profiles (i.e., the sum of all forms).

\*\*This entry refers to two large groups of chlorinated compounds. In assessing their cancer risks, their quantitative potencies are usually derived from that of the most toxic, 2,3,7,8-tetrachlorodibenzodioxin.

\*\*\*MTBE is listed due to its potential inhalation air toxics effects and not due to ingestion exposure associated with drinking water contamination.

\*\*\*\*Polycyclic Organic Matter includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100 degrees centigrade. A group of seven polynuclear aromatic hydrocarbons, which have been identified by EPA as probable human carcinogens (benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, 7,12-dimethylbenz(a)anthracene, and indeno(1,2,3-cd)pyrene) are sometimes used as a surrogate for the larger group of POM compounds.

#### **D. How Our List of MSATs Compares to Other Lists or Sources of Data on Toxics**

There are other sources that provide information characterizing the cancer and noncancer health effects associated with exposure to air toxics. In identifying our MSAT list we relied upon the health effects data from the EPA IRIS database because it represents EPA's scientific consensus opinion on the health effects associated with exposure to various pollutants.

We also compared our emissions speciation data to four other lists of toxic air pollutants to confirm that our MSAT list is reasonable. The four lists of toxic air pollutants are: the Clean Air Act (CAA) Section 112(b) list of hazardous air pollutants; California EPA (CalEPA) list of toxic air contaminants (TAC); U.S. Department of Health and Human Service Agency for Toxic Substances and Disease Registry (ATSDR) list of Minimal Risk Levels (MRLs); and International Agency for Research on Cancer (IARC) monographs on cancer.

Comparing these four lists against the emissions speciation studies, we identified two additional compounds not included on our list of 21 MSAT – propionaldehyde and 2,2,4-trimethylpentane. Both the Cal EPA TAC list and the CAA section 112(b) HAP list contain these compounds.



At this time EPA is not including propionaldehyde or 2,2,4-trimethylpentane in the list of MSATs because EPA has not drawn a conclusion on the potential adverse health effects associated with exposure to these pollutants. We request comment on whether these two compounds should be included on our MSAT list and, if so, why. Comments should include scientific information on the potential health effects of these pollutants.

#### **E. Diesel Health Assessment Document**

One of the key features of today's program is that we are proposing to designate diesel exhaust as a mobile source air toxic. The following paragraphs describe the most current information regarding the EPA's assessment of the health effects of exposure to diesel exhaust and provide information regarding actions by other agencies to evaluate the hazard associated with exposure to diesel exhaust.

EPA determined a reference concentration in 1993 to minimize noncancer health effects resulting from exposure to diesel exhaust. EPA has summarized available information to characterize the cancer and noncancer health effects from exposure to diesel exhaust emissions in the draft *Health Assessment Document for Diesel Emissions* (the Assessment). This information is also presented in the TSD.

The key components of the current draft Assessment are: (1) information about the chemical components of diesel exhaust and how they can influence toxicity, (2) the cancer and noncancer health effects of concern for humans, and (3) the possible impact or risk to an exposed human population. EPA is currently revising the Assessment based on a February 2000 review by the Agency's Science Advisory Board (SAB) Clean Air Scientific Advisory Committee (CASAC). A revised Assessment is expected to be available for peer review and public comment in late July 2000. The Assessment will be reviewed by CASAC late in 2000. The updated Assessment will inform the Technical Analysis Plan described in today's proposed program.

The proposed finding in EPA's draft Health Assessment Document, under review by CASAC, is that diesel exhaust is a likely human carcinogen in the lung at environmental levels of exposure and that exposure to diesel exhaust can pose a noncancer health hazard.

The concern for the cancer and noncancer health hazard resulting from diesel exhaust exposure is widespread. Several national and international agencies have designated diesel exhaust or diesel particulate matter as a 'potential' or 'probable' human carcinogen. The International Agency for Research on Cancer (IARC) considers diesel exhaust 'probably carcinogenic to humans'. Based on IARC findings, the State of California identified diesel exhaust in 1990 as a chemical known to the State to cause cancer and has listed diesel PM as a toxic air contaminant. The National Institutes for Occupational Safety and Health has classified diesel exhaust a "potential occupational carcinogen." The Department of Health and Human Services (DHHS) recently designated diesel exhaust particulates as "reasonably anticipated to be a human carcinogen" in its Ninth Report on Carcinogens.

#### **F. Diesel Exhaust and Diesel Particulate Matter**

Diesel exhaust include gaseous and particulate components. Gaseous components

of diesel exhaust include organic compounds, nitrogen-containing compounds, sulfur compounds, carbon monoxide, carbon dioxide, water vapor, and excess air (nitrogen and oxygen). Among these gaseous organic compounds are benzene (a known human carcinogen), formaldehyde, acetaldehyde, and 1,3-butadiene (possible or probable human carcinogens). Particulate components include many organic compounds that are mutagenic as well as several trace metals (including chromium, manganese, mercury and nickel) that may have general toxicological significance (depending on the specific species). In addition, small amounts of dioxins have been measured in diesel exhaust, some of which may partition to the particle phase.

Because diesel exhaust is a mixture of particles and gases, the choice of a measure of exposure (i.e., dosimeter) is important. EPA believes that exposure to whole diesel exhaust is best described, as many researchers have done over the years, by diesel particulate concentrations expressed in units of mass concentration (e.g.,  $\mu\text{g}/\text{m}^3$ ). The choice of this dosimeter implies that the contribution of the gaseous components and diesel particulate constituents to toxicity are related by diesel particulate mass. This assumption is consistent with historic practice, but can only be validated when there is a better understanding of the toxicological mode of action for diesel exhaust.

While some of the cancer and noncancer hazard may be associated with exposure to the gaseous component of diesel exhaust, studies suggest that the particulate component plays a substantial role in carcinogenicity and noncancer effects. Investigations show that diesel particles (the elemental carbon core plus the adsorbed organics) induce lung cancer at high doses and that the particles, independent of the gaseous compounds, elicit an animal lung cancer response. The presence of non-diesel elemental carbon particles, as well as the organic-laden diesel particles, correlate with an adverse inflammatory effect in the respiratory system of animals. Additional evidence suggesting the importance of the role of particulate matter in diesel exhaust includes the observation that the extractable particle organics collectively produce cancer and adverse mutagenic toxicity in laboratory experiments.

Given the available information, we are proposing to list diesel exhaust as a mobile source air toxic pollutant. We invite scientific and policy rationales for listing only the particulate component of diesel exhaust as an MSAT.

### **III. How Are Motor Vehicle Emission Control Programs Reducing MSAT Emissions?**

In the previous section we identified the 21 MSATs. We now turn to an evaluation of the impact of existing and planned controls on inventories of those air toxics by examining the emissions inventories and estimated reductions expected to be achieved by our various mobile source control programs.

The data and information available on emissions of these 21 MSATs vary considerably. While we have baseline inventory data for all of the MSATs except naphthalene, we do not have inventory projections for all of them. Therefore, we are examining the projected impacts of our current and proposed mobile source control program by groupings of air toxics. More specifically, we have projections of future

emissions for five gaseous toxics (benzene, formaldehyde, 1,3-butadiene, acetaldehyde, MTBE) and for diesel PM<sup>16</sup> and we present these in this section. However, we do not have emissions projections for the remaining gaseous toxics (acrolein, POM, styrene, toluene, xylene, ethylbenzene, naphthalene, and n-hexane), but because these compounds are part of VOCs, we believe it is reasonable to utilize VOC emissions inventory projections to track the expected impact of our control programs on these other gaseous MSATs. Finally, we also do not have emissions inventory projections for the metals on the MSAT list (arsenic compounds, chromium compounds, mercury compounds, nickel compounds, manganese compounds, and lead compounds) or for dioxins/furans. While metal emissions and dioxin/furans emissions are associated with particles, and it is possible that they track PM emissions to some extent, we do not have good data on these relationships. Therefore, we are not presenting emission projections for these compounds in this notice.

As we describe in the following discussion, there have been and will continue to be significant reductions in MSAT emissions as a result of implemented, promulgated, and proposed regulations. By 2020, we project on-highway emissions of gaseous toxics such as benzene, formaldehyde, 1,3-butadiene, and acetaldehyde, to decrease by 75 percent or more from 1990 levels as a result of our mobile source control programs up to and including our Tier 2 control program and our recently proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements (HD2007 rule). Under these current and proposed controls we expect on-highway diesel PM emissions to be reduced by more than 90 percent by 2020, as compared with 1990 levels. Nonroad engines and equipment also contribute substantially to levels of MSAT emissions and have only in recent years been subject to emission standards. Since nonroad engines are not subject to the same stringent controls as on-highway vehicles, the reductions from these sources are more moderate than those for on-highway sources.

The discussion in this section consists of two parts. First, we describe current inventories of MSAT emissions. Next, we describe how our on-highway emission control programs will reduce them. Interested readers should refer to Chapter 4 of our Technical Support Document for more detailed information about the methodology we used to compile these inventories and the results of our analysis. We consider the impacts of our nonroad engine control programs on MSAT emissions in Section VI of this preamble.

#### **A. Baseline Inventories**

We developed inventory estimates for several gaseous MSATs (acetaldehyde, benzene, 1,3-butadiene, formaldehyde, MTBE) and also for diesel PM as part of the 1999 study, “Analysis of the Impacts of Control Programs on Motor Vehicle Toxic Emissions and Exposure in Urban Areas and Nationwide,” described in Section I.E, above (hereafter

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<sup>16</sup>In this notice the emissions inventory for diesel exhaust is looked at in terms of diesel PM, as that is what we have measured to date. Thus, even though we are proposing to list diesel exhaust as an MSAT, all emissions inventory and trends numbers are stated in terms of diesel PM.

referred to as the 1999 EPA Motor Vehicle Air Toxics Study, or the 1999 Study).<sup>17</sup> We addressed these five gaseous MSATs and diesel PM because we had detailed information on the emission impacts of emission control technologies, fuel properties, and other parameters for these compounds.

The 1999 EPA Motor Vehicle Air Toxics Study provides 1990 and 1996 estimates of emissions for these compounds. The 1990 baseline represents estimated emissions before any of the programs added by the 1990 Clean Air Act Amendments were implemented. The 1996 estimates reflect toxics emissions with some of the new Clean Air Act programs in place, such as Phase 1 of the RFG program. We present emission estimates for these years in Table III-1. Note that since completion of the Study, we have updated our estimates of diesel PM emissions; these updated estimates are presented in Table III-1. It should also be noted that these estimates are only for on-highway vehicles.

Table III-1  
Annual Emission Summary for the Total U.S. for Selected Air Pollutants  
On-Highway Vehicles Only  
(short tons<sup>18</sup> per year)

Compound	1990 Baseline Emissions	1996 Emissions
1,3-butadiene	36,000	22,000
Acetaldehyde	41,000	27,000
Benzene	257,000	165,000
Formaldehyde	139,000	80,000
Diesel PM <sup>19</sup>	235,000	180,000
MTBE	55,000	65,000

The 1996 National Toxics Inventory (NTI) prepared in connection with the Agency's NATA activities, described above, also contains emission estimates for 1,3-

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<sup>17</sup>Analysis of the Impacts of Control Programs on Motor Vehicles Toxics Emissions and Exposure in Urban Areas and Nationwide (Volumes 1 and 2), November 1999. EPA420-R-99-029/030. This report can be accessed at <http://www.epa.gov/otaq/toxics.htm>.

<sup>18</sup>In this notice we report emissions in terms of short tons as opposed to metric tons. One short ton is 2,000 pounds. To convert to metric tons, multiply short tons by 0.9072. Note that all emissions and percentages in this and subsequent tables are rounded.

<sup>19</sup>The 1996 diesel PM estimate is based on the Tier 2 rulemaking inventories, updated to reflect the Updated Tier 2 Emissions Inventory for light-duty diesel exhaust and the proposed 2007 heavy-duty engine rule for heavy-duty diesel exhaust. For 1990, we used estimates from EPA's Trends Report for that year, as described below.

butadiene, acetaldehyde, benzene, formaldehyde and MTBE. The 1996 NTI emission estimates for these compounds differ slightly from those generated in the 1999 Study, due largely to revisions made to the NTI based on state comments. Since diesel exhaust are not included on the list of 112(b) hazardous pollutants, which is the focus of the 1996 NTI, diesel PM estimates have not been compiled there.

The 1996 National Toxics Inventory (NTI) prepared in connection with the Agency's NATA activities, described above, also contains emission estimates for 1,3-butadiene, acetaldehyde, benzene, formaldehyde and MTBE. The 1996 NTI emission estimates for these compounds differ slightly from those generated in the 1999 Study, due largely to revisions made to the NTI based on state comments. Since diesel exhaust are not included on the list of 112(b) hazardous pollutants, which is the focus of the 1996 NTI, diesel PM estimates have not been compiled there.

The 1996 NTI also contains 1996 emissions estimates for several other MSATs, and includes data for nonroad<sup>20</sup> as well as on-highway sources. We present these data in Table III-2. We also indicate the on-highway and nonroad percentages of the national inventories for these MSATs (the total national inventories include emissions from on-highway and nonroad mobile sources, major and area stationary sources, and other sources such as forest fires). Between the 1999 EPA Motor Vehicle Air Toxics Study and the 1996 NTI, we have baseline inventory data for all of the 21 MSATs except

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<sup>20</sup>The nonroad inventory in the 1996 NTI includes emissions data for aircraft, commercial marine vessel, locomotives, and other nonroad engines. Note that under the Clean Air Act definition, nonroad does not include aircraft. For convenience, in this notice the term "nonroad" will include aircraft except where otherwise noted. It should be noted that the NONROAD model, on which the estimates for nonroad engines other than locomotive, commercial marine vessels, and aircraft are based, is still draft, and the emissions estimates based on this model are subject to change.

Table III-2  
1996 On-Highway and Nonroad Emission Inventories of Proposed MSATs  
1996 NTI (short tons)

Compound	On-Highway		Nonroad		Mobile Sources	
	Tons	Percent of Total National Emissions	Tons	Percent of Total National Emissions	Tons	Percent of Total National Emissions
1,3-Butadiene*	23,500	42%	9,900	18%	33,400	60%
Acetaldehyde*	28,700	29%	40,800	41%	69,500	70%
Acrolein*	5,000	16%	7,400	23%	12,400	39%
Arsenic Compounds*	0.25	0.06%	2.01	0.51%	2.26	0.57%
Benzene*	168,200	48%	98,700	28%	266,900	76%
Chromium Compounds*	14	1.2%	35	3%	49	4.2%
Dioxins/Furans* <sup>21</sup>	0.0001	0.2%	N.A.	N.A.	0.0001	0.2%
Ethylbenzene	80,800	47%	62,200	37%	143,000	84%
Formaldehyde*	83,000	24%	86,400	25%	169,400	49%
Lead Compounds*	19	0.8%	546	21.8%	565	22.6%
Manganese Compounds*	5.8	0.2%	35.5	1.3%	41.3	1.5%
Mercury Compounds*	0.2	0.1%	6.6	4.1%	6.8	4.2%
MTBE	65,100	47%	53,900	39%	119,000	86%
n-Hexane	63,300	26%	43,600	18%	106,600	44%
Napthalene	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Nickel Compounds*	10.7	0.9%	92.8	7.6%	103.5	8.5%
POM (as sum of 7 PAH)*	42.0	4%	19.3	2%	61.3	6%
Styrene	16,300	33%	3,500	7%	19,800	40%
Toluene	549,900	51%	252,200	23%	802,100	74%

<sup>21</sup>Mass given in tons of TEQ (toxic equivalency quotient). The EPA Office of Research and Development (ORD) has recently developed an inventory for dioxin and dioxin-like compounds using different methods than those used in the NTI. For 1995, the EPA-ORD estimate of on-highway emissions of dioxin compounds is 0.00005 tons TEQ, comprising 1.5 percent of the national inventory in that year.

Xylene	311,000	43%	258,400	36%	569,400	79%
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\* Indicates also on the list of urban HAPs for the Integrated Urban Air Toxics Strategy mercury compounds and naphthalene.<sup>22</sup>

The above inventory data reflect certain interesting characteristics of mobile source air toxics emissions. First, mobile sources account for the majority of the national inventory of three of the gaseous MSATs that are included on the urban HAP list. These three are 1,3-butadiene (60 percent), acetaldehyde (70 percent), and benzene (76 percent). Mobile sources account for 39 percent of the national inventory of acrolein, and 49 percent of the national inventory of formaldehyde, two other gaseous urban HAPs. All of these MSATs are formed as part of the combustion process. In addition, benzene is also released through evaporative emissions from gasoline.

Second, with regard to the other MSATs that are included on the urban HAP list, the mobile source contribution generally is small (arsenic compounds, chromium compounds, manganese compounds, nickel compounds, POM, and dioxins/furans). The sole exception is lead compounds. Mobile sources contribute 23 percent to national inventories of lead compound emissions, due primarily to nonroad sources and, more specifically, to the use of a lead-additive package used to boost the octane of aviation gasoline.<sup>23</sup> The mobile source contribution to the other metals on the urban HAP list comes primarily from engine wear, some fuel additives, or impurities in engine oil.

With regard to the gaseous MSATs that are not included on the urban HAP list (ethylbenzene, MTBE, n-hexane, styrene, toluene, and xylene), mobile source contributions are high because of the presence of these compounds in gasoline.

In addition, mobile sources account for almost all of diesel PM emissions. As shown in Table III-1, above, we estimate that 1996 on-highway diesel PM emissions are approximately 180,000 tons. We estimate that 1996 nonroad diesel PM emissions are approximately 346,000 tons, as discussed in Section VI of this notice.<sup>24</sup>

## **B. Impacts of Motor Vehicle Emission Controls on Emission Inventories**

### **1. Description of Emission Control Programs**

Many of the programs that we have put in place since the passage of the 1990 Clean Air Act Amendments to achieve attainment of the National Ambient Air Quality Standards (NAAQS) for ozone, PM and CO have also reduced MSAT and diesel PM

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<sup>22</sup>Naphthalene emissions are not reported in the 1996 NTI separately from 16-PAH. Since diesel exhaust emissions are not included in the list of 112(b) hazardous pollutants that is the focus of the 1996 NTI, diesel PM emissions estimates have not been compiled there. See Chapter 3 of the TSD for the explanation of the linkage between diesel exhaust and diesel PM.

<sup>23</sup>Aviation gasoline is used by a relatively small number of aircraft, those with piston engines, which are generally used for personal transportation, sightseeing, crop dusting, and similar activities.

<sup>24</sup>Note that the nonroad diesel PM emissions estimate is still draft and is subject to change.

emissions. For example, measures to control hydrocarbons from motor vehicles are also effective in controlling gaseous toxics. In addition, certain programs address air toxics directly, such as the RFG program and the gasoline lead phase-out. In this section we briefly describe several categories of mobile source emission control measures that have helped reduce inventories of these harmful compounds. These programs include:

- More stringent vehicle standards and test procedures. The 1990 Clean Air Act Amendments set specific emission standards for hydrocarbons and for PM. Air toxics are present in both of these pollutant categories. As vehicle manufacturers develop technologies to comply with the hydrocarbon and particulate standards (e.g., more efficient catalytic converters), we expect air toxics to be reduced as well. Since 1990, we have developed a number of programs to address exhaust and evaporative hydrocarbon emissions and PM emissions. Some of the key programs are the Tier 1 and NLEV standards for light-duty vehicles and trucks; enhanced evaporative emissions standards; the supplemental federal test procedures (SFTP); urban bus standards; and heavy-duty diesel and gasoline standards for the 2004/2005 time frame.
- Recent motor vehicle/fuel control initiatives. Two of our recent initiatives to control emissions from motor vehicles and their fuels are the Tier 2 control program and our recently proposed 2007 heavy-duty engine rule. Together these two initiatives define a set of comprehensive standards for light-duty and heavy-duty motor vehicles and their fuels. In both of these initiatives, we treat vehicles and fuels as a system. The Tier 2 control program establishes stringent tailpipe and evaporative emission standards for light-duty vehicles and a reduction in sulfur levels in gasoline fuel beginning in 2004. The proposed 2007 heavy-duty engine rule proposes stringent exhaust emission standards for heavy-duty engines and vehicles for the 2007 model year as well as reductions in diesel fuel sulfur levels starting in 2006.
- Limits on gasoline volatility. Volatility is a measure of how easily a liquid evaporates. As described earlier, some toxics such as benzene are present in gasoline and get into the air when gasoline evaporates. We imposed limits on gasoline volatility in the early 1990s to control evaporative emissions of both hydrocarbon and toxic compounds (most air toxics are hydrocarbons, so programs designed to reduce hydrocarbon emissions also reduce air toxics).
- Reformulated gasoline. The 1990 Clean Air Act Amendments required reformulated gasoline to be introduced in the nation's most polluted cities beginning in 1995. From 1995 through 1999, these gasolines were required to provide a minimum 16.5 percent reduction in air toxics emissions over typical 1990 gasolines, increasing to a 21.5 percent minimum reduction beginning in the year 2000. The air toxics reductions have been achieved mainly by further reducing gasoline volatility and by reducing the benzene, aromatics, sulfur, and olefin content of the gasoline.
- Phase-out of lead in gasoline. One of the first programs was the removal of lead from gasoline. The lead phase out began in the mid-1970s. It was completed



January 1, 1996 when lead was banned from motor vehicle gasoline. The removal of lead from gasoline has essentially eliminated on-highway mobile source emissions of this highly toxic substance.

- Ensuring emissions are controlled while vehicle actually used. Many of our vehicle standards require certification of new engines and vehicles, but ensuring continued performance of emission controls can be difficult. The Clean Air Act establishes several programs to make sure vehicle emission controls are functioning properly in actual use. These programs include requirements for periodic emission inspections (I/M, or inspection and maintenance programs) and for computerized diagnostic systems that alert drivers and mechanics to malfunctioning emission controls.

We encourage the interested reader to refer to Chapter 1 of our TSD for more detailed information about these programs.

## 2. Emission Reductions from Control Programs

We expect the mobile source emissions control programs described above to have beneficial impacts on the national inventories of MSATs. The remainder of this section summarizes our MSAT inventory projections. First, we present an overview of our inventory methodologies. Next, we present the results of our inventory projections. We encourage interested readers to refer to Chapter 4 of our TSD for a more detailed discussion of these projections and how we developed them. The inventory projections in this section are for on-highway vehicles only, since we have the most complete information for this category of mobile sources. Projections of nonroad MSAT emissions are included in Section VI of this preamble.

### a. Overview of Inventory Sources

We have developed inventory projections for five gaseous MSATs, for VOC, and for diesel PM for the years 2007 and 2020 under our current and proposed control programs. These programs include the national low-emission vehicle (NLEV) program, the reformulated gasoline (RFG) program, the 2004 heavy-duty diesel and gasoline engine standards, the Tier 2/Sulfur controls, and our recently proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements (HD2007 rule).

The inventory projections for the five gaseous toxics are based on the 1999 EPA Motor Vehicle Air Toxics Study, and data from a spreadsheet model developed in support of the proposed 2007 heavy-duty engine rule.<sup>25</sup> The 1999 Study estimated on-highway motor vehicle air toxics emissions for ten urban areas (Atlanta, Chicago, Denver, Houston, Minneapolis, New York City, Philadelphia, Phoenix, Spokane, and St. Louis) and 16 geographic regions. These areas were selected to reflect the range of potential fuels, temperatures, and I/M programs observed in the U.S. The estimation methodology used in the 1999 Study was similar to that used in our original 1993 Motor Vehicle Related Air Toxics Study. In our approach, the MOBILE model is used to generate total organic gas (TOG) emissions from on-highway motor vehicles by vehicle class and

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<sup>25</sup>This spreadsheet model can be found in EPA Air Docket A-99-06, Item II-B-31.

model year. Toxics fractions, developed as a percentage of the toxic compound of interest contained in TOG emissions, are then applied to the MOBILE-based TOG emission rates (reported in grams per mile) to arrive at toxics emission rates (reported in grams per mile or milligrams per mile). These toxics fractions are developed as a function of vehicle class (e.g., light-duty, heavy-duty), fuel type (e.g., gasoline or diesel), fuel composition, and technology type (e.g., non-catalyst, catalyst).

We do not have detailed emissions data for gaseous MSATs other than the five gaseous MSATs examined in the 1999 Study. However, we expect the trend for other gaseous MSATs, including acrolein, POM, styrene, xylene, toluene, ethylbenzene, naphthalene, and n-hexane, to follow that of VOC, since all of these compounds are VOCs. Therefore, to estimate projected inventory impacts from mobile source emission control programs, we use VOC inventories.

We believe this is appropriate because all of these compounds are constituents of VOCs, and we expect their inventories to decrease in proportion to decreases in overall VOC emissions. We recognize that some gaseous MSATs may not decrease at the same rate as VOCs overall. Without having more detailed emission data for each of the MSATs, however, we are unable to project how those rates may differ. We request comment on this approach, and on how to develop inventory projections for the other gaseous MSATs.

Our VOC and diesel PM emission estimates are derived from several sources. The 1996 and later values for light-duty vehicles are based on the Tier 2 rulemaking inventories, updated to reflect the Updated Tier 2 Emissions Inventory spreadsheet.<sup>26</sup> The 1996 and later values for heavy-duty engines and vehicles are based on data from a spreadsheet model developed in support of the proposed 2007 heavy-duty engine rule.<sup>27</sup> The 1990 VOC emission estimate is based on the 1999 EPA Motor Vehicle Air Toxics Study,<sup>28</sup> and the 1990 diesel PM is from EPA's Trends Report.<sup>29</sup>

We are not reporting inventory trends for the metals on our list of MSATs (arsenic compounds, chromium compounds, mercury compounds, nickel compounds, manganese compounds, and lead compounds) or for dioxins/furans. Metals in mobile source exhaust can come from fuel, fuel additives, engine oil, engine oil additives, or engine wear.

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<sup>26</sup>Details of this approach can be found in a memorandum by Harvey Michaels to Docket A-2000-12 titled "Adjustment to the Tier 2 Air Quality Inventory for the Mobile Source Air Toxics Proposed Rule".

<sup>27</sup>This spreadsheet model can be found in EPA Air Docket A-99-06, Item II-B-31.

<sup>28</sup>The analysis methodology is described in a memorandum from Meredith Weatherby, Eastern Research Group, to Rich Cook, EPA, entitled "Estimating of 1990 VOC and TOG Emissions" in EPA Air Docket A-2000-12.

<sup>29</sup>EPA, 2000. National Air Pollution Emission Trends, 1900-1998 (March 2000). Office of Air Quality Planning and Standards, Research Triangle Park, NC. Report No. 454/R-00-002.

Formation of dioxin and furans requires a source of chlorine. Thus, while metal emissions and dioxin/furan emissions are associated with particles, there are a number of other factors that contribute to emission levels. While it is possible that these compounds track PM emissions to some extent, we do not have good data on these relationships.

b. Emission Reductions

Table III-4 presents the annual emission projections for on-highway vehicles in the years 2007 and 2020 for five gaseous toxics, VOC, and diesel PM with our current and proposed on-highway control programs.

Table III-4  
Annual Fifty-State Emissions Summary for Selected Air Pollutants  
With Tier 2 and Proposed Heavy-Duty 2007 Controls  
On-Highway Vehicles Only from 1990 to 2020  
(thousand short tons per year)

Compound	1990	1996	2007	2020
Benzene	257	165	86	65
Acetaldehyde	41	27	14	8
Formaldehyde	139	80	35	17
1,3 Butadiene	36	22	11	9
MTBE*	55	65	25	18
VOC	7,585	4,819	2,662	1,838
Diesel PM	235	180	82	15

\* These estimates do not include consideration of EPA's examination of options to phase down or otherwise control the use of MTBE under the Toxic Substances Control Act, or legislative authority that EPA has asked Congress to provide the Agency to address MTBE use in gasoline.

Table III-5 summarizes the percent reductions we expect in on-highway emissions of gaseous MSATs, VOC, and diesel PM from 1990 and 1996 levels in 2007 and 2020 as a result of our current and proposed on-highway control programs.

Table III-5  
Summary of Fifty-State Percent Emission Reductions  
With Tier 2 and Proposed Heavy-Duty 2007 Controls  
On-Highway Vehicles Only in 2007 and 2020  
from 1990 or 1996

Compound	Reduction in 2007		Reduction in 2020	
	From 1990	From 1996	From 1990	From 1996
Benzene	67%	48%	75%	61%
Acetaldehyde	65%	47%	82%	73%
Formaldehyde	75%	55%	87%	78%
1,3 Butadiene	69%	49%	75%	60%
MTBE*	54%	61%	67%	72%
VOC	65%	45%	76%	62%
Diesel PM	65%	48%	94%	92%

\* These estimates do not include consideration of EPA's examination of options to phase down or otherwise control the use of MTBE under the Toxic Substances Control Act, or legislative authority that EPA has asked Congress to provide the Agency to address MTBE use in gasoline.

The results of this analysis show that on-highway emissions of the five gaseous MSATs examined are expected to decline by approximately 75 percent by 2020 from 1990 levels with our existing and proposed controls. For some gaseous MSATs, the reductions are even greater. For example, we project both formaldehyde and acetaldehyde emissions will decrease by over 80 percent by 2020 from 1990 levels with our current and proposed controls. Likewise, VOC inventories from on-highway vehicles are projected to decrease as much as 75 percent between 1990 and 2020 and we assume that other gaseous toxics would decrease by approximately 75 percent as well. Finally, diesel PM emissions are expected to decline by over 90 percent by 2020 from 1990 levels.

Though these air toxics emissions reductions are substantial, we are not certain whether or not more control in the future is warranted for the remaining emissions from these air toxics. They have the potential to present serious health impacts to the public under certain circumstances that we have not been able to investigate fully. We also believe there is merit in considering further vehicle and fuel controls for both highway and nonroad sources for addressing the remaining emissions given the ever-changing nature of pollution control technology. These controls would be considered as part of our proposed Technical Analysis Plan outlined in Section VII.

### C. Summary

In this section, we presented our inventory projections for MSATs. These projections, which are limited to on-highway mobile sources, show that with our current and proposed emission control programs up to and including Tier 2 and our recently proposed 2007 heavy-duty engine rule, on-highway emissions of gaseous MSATs are expected to decline by approximately 75 percent by 2020 from 1990 levels, and on-highway emissions of diesel PM are expected to decline by over 90 percent by 2020 from 1990 levels. These reductions will result from the more stringent VOC and PM controls that we have put into place over the last decade or have recently adopted (Tier 2) or proposed (HD2007).

#### **IV. Evaluation of Additional Motor Vehicle-based Controls**

This section discusses the relationship between EPA's vehicle-based control programs and the control of MSATs, the impact of our most recent efforts to control VOCs, and the need for additional control of MSATs.

##### **A. MSATs and Motor Vehicle-based Controls**

The majority of gaseous MSATs are hydrocarbons that are primarily the result of incomplete combustion of petroleum fuels (a small amount of raw fuel may also pass through the engine unburned). Technologies used to reduce exhaust hydrocarbons also reduce MSAT hydrocarbon species. This is true whether control is achieved through engine or component modifications, add-on devices, or the use of aftertreatment devices such as oxidation or three-way catalysts. We are not aware of vehicle or engine technologies that selectively reduce MSATs without reducing other hydrocarbons to a similar degree.

The other major source of hydrocarbon emissions from motor vehicles are fuel vapors. These emissions occur when components of the liquid fuel (gasoline or diesel) evaporate when onboard the vehicle. The emissions are normally separated into refueling emissions and evaporative emissions (hot soak, diurnal, and running losses). The nature and amount of potential MSATs associated with fuel vapors depend primarily on the fuel composition and the temperatures involved. Gasoline is volatile and evaporates at normal ambient temperatures, while diesel fuel is relatively non-volatile. Thus evaporative emissions are only an issue for gasoline-fueled vehicles (or vehicles using volatile alternative fuels such as methanol). Evaporative and refueling emissions are controlled by eliminating sources of potential liquid and vapor leaks within the vehicle fuel system and venting any vapors to an activated carbon canister or similar device. Activated carbon effectively adsorbs most hydrocarbon compounds, including the common evaporative-related MSATs.

Particulate matter emissions from motor vehicles are primarily composed of partially burned carbon and hydrocarbons from the fuel and engine oil, and to a lesser degree, metals and other inorganic compounds from contaminants or additives in the fuel or engine oil, or products of engine wear in the oil. Since our PM exhaust emission standards apply without regard to the source of the PM, manufacturers must account for all of these emissions. Manufacturers have significantly reduced PM emissions associated with unburned fuel and engine oil through combustion system and engine

modifications.

## **B. EPA's Motor Vehicle-based Emission Control Program**

To understand the relationship between the Agency's current emission control program for on-highway vehicles and the control of MSATs, it is important to first understand the structure and scope of our current emission control programs. EPA's emission control program for on-highway vehicles has historically been divided into two broad vehicle/engine categories that we regulate: "light-duty" (vehicles 8,500 pounds gross vehicle weight rating (GVWR) or less) and "heavy-duty" (vehicles above 8,500 pounds GVWR).<sup>30</sup> Within these light-duty and heavy-duty categories, we further distinguish vehicles and sometimes establish different emission limits based on vehicle size or other factors. For example, within the light-duty category, in the past we have often had different programs for light-duty vehicles and light-duty trucks.

### **1. Light-duty Vehicles**

Before our regulations, cars emitted more than 9 grams per mile (gpm) HC in exhaust emissions. Our HC emission standards in the 1970s and 1980s cut these levels by more than an order of magnitude, to a level of 0.41 gpm in 1980. In 1991, we finalized Tier 1 controls for light-duty vehicles and light-duty trucks to be phased in from 1994 to 1996 (56 FR 25724). In 1998, we developed an innovative, voluntary nationwide program to make new cars, called National Low Emission Vehicles (NLEV), significantly cleaner than Tier 1 cars (63 FR 926). The NLEV program went into effect in the Northeast states in 1999 and will go into effect in the rest of the country in 2001. Table IV-1 illustrates the declining exhaust standards through the NLEV program that have resulted in HC reductions in the 1970s through the 1990s and are expected to result in future reductions.<sup>31</sup> In December 1999, the Agency finalized the Tier 2/sulfur rule establishing light-duty requirements that will be phased-in beginning with the 2004 model year. A more detailed discussion of the Tier 2 program follows in Section C.

Table IV-1  
Hydrocarbon (HC) Exhaust Emission Standards for Light-Duty Vehicles (gpm)

Year	1970	1972	1975	1980	1994	2001
HC	2.2	3.4	1.5	0.41	0.31 <sup>1</sup>	0.09 <sup>2</sup>

1: The 1994 standard is an nonmethane hydrocarbon (NMHC) standard.

2: The 2001 standard is an nonmethane organic gas (NMOG) standard.

Our existing regulations contain test procedures to measure evaporative hydrocarbon emissions during a simulated parking event (diurnal emissions) and

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<sup>30</sup> EPA recently created the new category of "medium-duty passenger vehicles" (MDPVs) that includes passenger vehicles over 8,500 pounds GVWR.

<sup>31</sup>Our programs achieve VOC reductions through standards that limit HC, NMHC, or NMOG.

immediately following a drive (hot soak emissions). In 1993, we finalized more stringent evaporative emission test procedures which apply to light-duty and heavy-duty gasoline vehicles. These procedures were fully phased in by 1999 (58 FR 16002). The 1993 rule also addressed fuel spitback during refueling with a vehicle test to ensure that no spillage occurs when a vehicle is refueled at a rate of up to 10 gallons (37.9 liters) per minute. The Tier 2 rule included even more stringent requirements.

We have also finalized on-board refueling vapor recovery (ORVR) requirements for light-duty gasoline vehicles (59 FR 16262, April 6, 1994), and proposed to extend ORVR to heavy-duty gasoline vehicles between 8,500 and 10,000 lbs GVWR (64 FR 58471, October 29, 1999). ORVR is a nationwide program for capturing refueling emissions by collecting vapors from the vehicle gas tank and storing them in the vehicle during refueling. The fuel vapors are then purged into the engine air intake to be burned while the vehicle is being driven.

## 2. Heavy-duty Vehicles

Table IV-2 summarizes the hydrocarbon and PM standards for heavy-duty engines. Also shown in the table are estimates of emission rates from uncontrolled engines. Not shown in the table are the standards in our recently proposed 2007 heavy-duty rulemaking.<sup>32</sup> In that NPRM we proposed exhaust emission standards of 0.14 NMHC and 0.01 PM for all heavy-duty engines.

Table IV-2  
HC and PM Exhaust Emissions and Standards for Heavy-Duty Engines

	Gasoline (Otto-Cycle)	Diesel	
	Exhaust HC	Exhaust HC	Exhaust PM
Uncontrolled Emissions	10-13 g/bhp-hr	4 g/bhp-hr	0.7 g/bhp-hr
Current Standards	1.1 g/bhp-hr <sup>a</sup>	1.3 g/bhp-hr	0.10 g/bhp-hr
2004/5 Standards	0.25 g/bhp-hr <sup>b</sup>	0.4 g/bhp-hr <sup>c</sup>	0.10 g/bhp-hr

a. Current standard is 1.9 g/bhp-hr for Otto-cycle vehicles over 14,000 GVWR.

b. Standard has been proposed as a 2005 NMHC+NO<sub>x</sub> standard; level shown is estimated equivalent NMHC standard.

c. Standard is a 2004 NMHC+NO<sub>x</sub> standard; level shown is estimated equivalent NMHC standard.

## C. **Feasibility of More Stringent Vehicle-based Standards to Reduce**

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<sup>32</sup> 65 FR 35429, June 2, 2000

## MSATs

Section III of this proposal highlights the very significant reduction in toxics emissions that have been achieved as a result of EPA's on-highway emission control programs. Most recently, the Agency has finalized the Tier 2/sulfur requirements which will require manufacturers to incorporate the latest light-duty emission controls. EPA has also proposed new heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements that would also result in large emission reductions.<sup>33</sup> This section summarizes these two new technology-forcing programs.

### 1. Light-duty Vehicles

Finalized in December 1999, the Tier 2/sulfur requirements phase-in a single set of tailpipe emission standards that will, for the first time, apply to all passenger cars, light-duty trucks (LDTs), and larger passenger vehicles. To enable the very clean Tier 2 vehicle emission control technology to be introduced and to maintain its effectiveness, nationwide gasoline sulfur requirements were also put into place. The Tier 2 program begins in 2004 for passenger cars and light LDTs (LDTs up to 6,000 pounds GVWR), while an interim program begins in 2004 for heavy LDTs (LDTs over 6,000 pounds GVWR). For heavy LDTs and MDPVs (medium-duty passenger vehicles), the Tier 2 standards will be phased in beginning in 2008, with full compliance in 2009. Thus, when fully implemented all vehicles designed for passenger use will have to meet the stringent new emission standards.

The Tier 2 program is designed to focus on reducing the ozone and particulate matter air quality impact for these vehicles. Ozone reductions will be achieved through control of nitrogen oxides and non-methane hydrocarbons. As discussed above, it is the control of NMHC through the NMOG standards that results in the control of the gaseous toxics. Control of PM emissions will occur through reductions in sulfur. The Tier 2 rule also established stringent PM standards. Because all Tier 2 standards are fuel neutral, the PM standards apply to both gasoline and diesel vehicles.

The Tier 2 standards will reduce new vehicle NOx levels to an average of 0.07 grams per mile. The NMOG standards vary depending on which of the various "bins" (i.e., certification categories) the manufacturers choose to use in complying with the average NOx standard. However, we expect significant reductions in NMOG emissions from these vehicles as a result of the more stringent NMOG standards in the bins and the need to select bins to meet the NOx average. When fully phased-in, we expect fleet average NMOG levels below the 0.09 g/mi level. The Tier 2 rule also finalized formaldehyde standards that harmonize federal standards with the California's LEV II program. The standards are primarily of concern for vehicles fueled with methanol because formaldehyde is chemically similar to methanol and is likely to be produced when methanol is not completely burned in the engine.

In order to meet strict Tier 2 standards on a fleet-wide average, manufacturers will have to use a combination of sophisticated calibration changes and emission system hardware modifications to increase and maintain high control system efficiency. They

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<sup>33</sup> 65 FR 35429, June 2, 2000



will be challenged to maintain tight air-fuel control and improved catalyst performance, especially achieving better catalyst thermal management. Minimizing the time necessary for the catalyst to reach its operating temperature will be especially critical, since the vast majority of emissions occur in the minute or less which passes before the catalyst “lights off.” Many manufacturers are going to have to depend more on the precious metal palladium for oxidation of NMOG and CO emissions, as well as the reduction of NO<sub>x</sub>, because palladium is more tolerant to high temperatures to increase in-use efficiency.

The Tier 2 standards for evaporative emissions represent, for most vehicles, more than a 50-percent reduction in diurnal plus hot soak standards from those that will be in effect in the years immediately preceding Tier 2 implementation. These standards should achieve similar reductions in gaseous MSATs, especially since activated carbon preferentially absorbs larger organic molecules. Under these requirements, it is likely that manufacturers will also need to upgrade materials and both increase the reliability of fuel/vapor hose connections and fittings and reduce the number used in the system.

Taken as a whole, the Tier 2 program presents the manufacturers with significant compliance challenges in the coming years. It will require the use of hardware and emission control techniques and strategies not used in the fleet today. Bringing essentially all passenger vehicles under the same emission control program regardless of their size, weight, and application is a major engineering challenge. While there may be other prototype technologies on the horizon which could potentially reduce cold-start emissions and therefore air toxics, given the cost and engineering burden associated with Tier 2, it is not appropriate to propose standards based on these technologies. We are not convinced that these technologies would be feasible and cost effective on a fleet-wide basis at this time. This is discussed in more detail in the TSD.

## 2. Heavy-duty Vehicles

With regard to exhaust emission standards, the 2007 heavy-duty engine standards would reduce hydrocarbon emissions to levels approaching 0.1 g/bhp-hr for both gasoline and diesel. This would result in a significant reduction even when compared to the 2004 standards. Similarly, the proposed exhaust PM standard for heavy-duty diesel engines is very stringent. The proposed value of 0.01 g/bhp-hr is a 90-percent reduction from current standards which are currently being achieved with significant combustion chamber and engine modifications. Achieving a 0.01 g/bhp-hr standard will require the use of particulate trap-oxidizers. This technology will also result in HC emission reductions. It is further worth noting that the 2007 proposal includes provisions for a closed crankcase for turbocharged diesel engines. Crankcase emissions from these engines are a significant source of MSATs (PM and hydrocarbons) which has previously remained uncontrolled.

For chassis-certified gasoline-powered heavy-duty vehicles, EPA proposed that beginning in 2007 they meet exhaust hydrocarbon standards of similar stringency to those discussed above for Tier 2. These include hydrocarbon standards of 0.195 g/mi for vehicles of 8,500-10,000 lbs GVWR and 0.23 g/mi for vehicles of 10,001-14,000 lbs GVWR.

Fuel quality changes will enable gasoline and diesel-powered vehicles/engines to

meet the more stringent standards over their full life. As part of the Tier 2 rule, EPA promulgated provisions limiting gasoline sulfur levels to 30 ppm average and 80 ppm cap. This program phases in beginning in 2004, and will enable a new generation of vehicle emission control for heavy-duty gasoline vehicles and also improve the emission performance of the current fleet. Sulfur is a fuel contaminant, and controlling sulfur will also reduce sulfate PM emissions. The 2007 heavy-duty proposal mentioned above also includes provisions to greatly reduce the sulfur content of current on-highway diesel fuel. Not only will this reduction enable the emission control technology now under development, but it will also reduce sulfate PM emissions as was the case for gasoline.

We have also proposed more stringent evaporative standards, which would force even further refinements in fuel/vapor systems. Onboard refueling vapor control is proposed to be effective for 2004 for all heavy-duty gasoline-powered vehicles. This would reduce emissions from current uncontrolled levels by 95 percent. In addition, as part of the 2007 proposal, evaporative emission standards are proposed to be reduced by 50 percent over current standards. Both refueling controls and further evaporative controls would reduce evaporative emissions of air toxics from heavy-duty vehicles even further.

The proposal for 2007 heavy-duty engine and vehicle standards contains extensive analysis and discussion of the technological feasibility. This analysis demonstrates that the proposed heavy-duty standards reflect the greatest degree of emission reduction achievable through the application of technology that will be available considering costs and other relevant factors. EPA expects that the recently proposed rulemaking to establish 2007 model year standards for heavy-duty diesel engines will satisfy the criteria in section 202(a) as well as 202(l)(2) and therefore defers to the technical decisions that will be made in that rulemaking. For further information on the diesel engine proposal see 65 Federal Register 35430 (June 2, 2000).

### **3. Conclusion**

The Tier 2 program represents a comprehensive, integrated package of exhaust, evaporative, and fuel quality standards. The Tier 2 program will achieve significant reductions in NMHC, NO<sub>x</sub>, and PM emissions from all light-duty vehicles in the program. Emission control in the Tier 2 program will be based on the widespread implementation of advanced catalyst and related control system technology. The standards are so stringent that they will require the maximum level of control technology be used. To illustrate this point, it is worth noting that about 80 percent of all emissions from a Tier 2 vehicle will occur in the first 60 seconds of operation, before the catalyst "lights-off." Manufacturers will have to optimize their cold-start strategies and the efficiency of warmed systems to achieve the Tier 2 levels. Compliance with the Tier 2 standards will require the application of emission technology not widely used in the light-duty fleet today and in some cases the use of technological approaches still under development. Meeting the Tier 2 requirements will significantly reduce air toxics as a result of reductions in NMHC.

The emission control program for heavy-duty engines and vehicles has achieved major reductions in the emissions of criteria pollutants and their precursor emissions.

New stringent emissions were established for heavy-duty diesel engines in a final rule promulgated in the fall of 1997 that will take effect in 2004. In October of 1999, we published a notice proposing to reaffirm the 2004 heavy-duty diesel engine emission standards. The notice also proposed new 2004 model year emission standards and related requirements for heavy-duty Otto-cycle vehicles/engines and supplemental test requirements for heavy-duty diesel engines.

We also recently announced a further initiative in control of heavy-duty vehicle/engine emissions in May 2000. This was done in the proposal to establish new heavy-duty diesel and Otto-cycle engine standards and vehicle emission standards for 2007. It also proposed new on-highway diesel fuel sulfur control requirements.

## **V. Evaluation of Additional Fuel-Based Controls**

In previous sections, we showed that the mobile source toxics inventory will continue to decline through 2020 due to existing programs. In this section we consider the role of fuels programs in reducing toxics emissions from mobile sources. Fuels contribute to air toxics emissions in two ways: evaporative emissions of the fuel, and exhaust emissions due to combustion of the fuel. One means of controlling toxics emissions from motor vehicles is to change the benzene content of the fuel.

In this section, we discuss our investigation of additional fuel-based controls for reducing toxics emissions. We begin with a discussion of the current gasoline-based toxics control programs, including a presentation of the over-compliance arising under the federal reformulated gasoline (RFG) and anti-dumping programs. This is followed by a discussion of why we believe that gasoline benzene control is an appropriate initial focus for additional fuel controls to reduce MSATs. Next, we present our proposed anti-backsliding program for fuel benzene in both RFG and conventional gasoline (CG). As part of this discussion we address the issue of state controls of benzene levels in gasoline. We discuss potential future benzene controls that would be included as part of the investigation in our proposed Technical Analysis Plan. Finally, we discuss other fuel controls considered in EPA's development of this proposal.

### **A. What Current Gasoline Programs Control Toxics Emissions?**

Current federal gasoline programs that control toxics emissions include the prohibition on leaded gasoline for highway use, the summertime volatility requirements, and the reformulated gasoline and anti-dumping programs. The first of these programs, the prohibition on leaded gasoline for use in motor vehicles, is a Clean Air Act requirement adopted in 1990 that was designed to complete the phase-out of leaded gasoline because of its contribution to national ambient lead levels. Lead is a probable human carcinogen with a variety of serious non-cancer health effects at low dose levels. The transition to unleaded gasoline began in 1974, and leaded gasoline has been banned for highway use since 1996 (see CAA §211(n)).

Under the second program, the federal volatility requirements, every area of the continental U.S. has a maximum summertime gasoline Reid vapor pressure (RVP). RVP is a volatility measurement of gasoline. Generally speaking, a fuel with a higher RVP evaporates more quickly than a fuel with a lower RVP. Thus, by instituting a maximum

summertime RVP for each area, we control evaporative emissions of the volatile components of gasoline, including benzene and other gaseous toxics.

The federal reformulated gasoline (RFG) program includes, in addition to standards on VOC and NOx emissions, several requirements related to toxics. Specifically, the RFG program (covering about one-third of the gasoline sold in the country) includes standards on the benzene content of fuel as well as standards governing the overall toxics emissions associated with evaporation and combustion of the fuel. Toxics emissions covered under the RFG program include exhaust and evaporative benzene, formaldehyde, acetaldehyde, 1,3-butadiene and polycyclic organic matter (POM). Under the Phase II RFG program which began in January 2000, a refinery's or importer's annual average total toxics emissions, as measured by the Complex Model<sup>34</sup>, must be 21.5 percent less than the toxics emissions attributable to the statutory baseline fuel. Additionally, a refinery's or importer's annual average RFG benzene content cannot exceed 0.95 percent by volume, and no batch may exceed 1.3 percent by volume. Alternatively, no batch of RFG may have a benzene content exceeding 1.0 percent by volume. Each refinery and importer must choose annually whether to comply with the average benzene requirement (0.95 volume percent) or the "per-gallon" benzene requirement (1.0 volume percent); essentially no refinery/importer chooses the latter compliance method.

EPA has also adopted standards to cover all fuel used outside of the RFG areas. These "anti-dumping" standards<sup>35</sup> include requirements for NOx performance and exhaust toxics performance. Exhaust toxics performance is measured using the Complex Model with all of the toxic compounds mentioned above except for evaporative benzene emissions. On a mass basis, exhaust benzene emissions comprise approximately 67 percent of total exhaust toxics emissions. Regarding exhaust toxics performance, the anti-dumping program requires that a refinery's or importer's total exhaust toxics emissions, as predicted by the Complex Model, not exceed that refinery's or importer's individual exhaust toxics emissions baseline, which is their 1990 performance level. Unlike the RFG program, the anti-dumping program does not specifically regulate the benzene content of conventional gasoline.

Based on 1998 compliance reports from refineries, average national compliance

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<sup>34</sup>The Complex Model is a regulatory tool for estimating emissions for the reformulated gasoline and anti-dumping programs. The Complex Model inputs are eight specified fuel parameters: benzene, oxygen content (by oxygenate type), sulfur, RVP, aromatics, olefins, and the percents evaporated at 200F and 300F (E200 and E300). Complex Model outputs are the estimated emissions (VOC, toxics, NOx) resulting from the fuel parameters specified. The Complex Model also calculates percent reductions of the input slate of fuel parameters and resulting emissions compared to a base set of fuel parameters and the resulting base emissions.

<sup>35</sup>The conventional gasoline standards are often referred to as the anti-dumping requirements because they prevent refiners from merely directing the clean gasoline to RFG areas and "dumping" the dirtier fuel in all other areas.

with the toxics portion of the reformulated gasoline and anti-dumping programs, including benzene requirements, exceeds the basic requirements. In other words, on average, refineries and importers produced gasoline in 1998 which over-complied with the applicable toxics and fuel benzene requirements. Table V-1 compares required levels or baseline levels, as applicable, of toxics emissions and fuel benzene under EPA's RFG and anti-dumping regulations with the actual levels achieved in 1998.

Table V-1  
Over-compliance with Existing Benzene and Toxics Standards

Type of gasoline	Reformulated	Conventional
Actual 1998 toxics performance (volume weighted)	30.3 percent reduction <sup>a</sup>	44 mg/mile <sup>b</sup>
Required or baseline Phase I toxics performance	16.5 percent reduction	47 mg/mile <sup>c</sup>
Actual 1998 benzene (volume weighted)	0.65 vol%	1.1 vol%
Required or baseline benzene (annual average)	0.95 vol%	1.3 vol% <sup>d</sup>

<sup>a</sup> For RFG, toxics performance is measured on the basis of *total* toxics with respect to the statutory baseline

<sup>b</sup> For CG, toxics performance is measured on the basis of *exhaust* toxics with respect to an individual refinery's 1990 baseline

<sup>c</sup> Under anti-dumping for CG, exhaust toxics in mg/mi per the Complex Model can be no higher than a refiner's 1990 annual average exhaust toxics emissions. The value of 47 mg/mi is the volume-weighted average of the standards applicable to all individual refineries

<sup>d</sup> EPA does not currently regulate the fuel benzene level of CG. The value of 1.3 vol% is the volume-weighted average of the 1990 baseline levels for all refineries.

Thus RFG produced in 1998 exhibited an average total toxics emissions reduction which was nearly twice that required, and had average gasoline benzene levels which were approximately one-third less than the maximum average allowed. For CG, the over-compliance was less dramatic, amounting to approximately six percent for exhaust toxics. Although there is currently no standard for the benzene content of CG, in 1998 the CG benzene levels were approximately 15 percent lower than the average of benzene levels for individual 1990 refinery anti-dumping baselines.

Note that the information contained in Table V-1 reflects industry averages. In fact, not all refineries and importers over-comply. Approximately 90 percent of RFG refineries and importers over-complied in 1998. Most refineries and importers in over-compliance for RFG benzene are also in over-compliance for CG benzene. EPA believes that this over-compliance, particularly with respect to benzene, is due to a number of factors, including:

- 1) Benzene extraction for the petrochemical industry. For certain refineries geographically located near petrochemical plants, it is profitable to remove benzene from reformate, a gasoline blending component, and sell it for petrochemical uses.

- 2) Dilution with oxygenates. The oxygenate requirement of the RFG program, and refineries' and importers' use of oxygenates in conventional gasoline as gasoline extenders or for octane, reduce and dilute overall aromatics (e.g., benzene, toluene and xylene, all of which are gaseous MSATs).

**B. Why Is EPA Focusing on Benzene?**

Benzene is an aromatic hydrocarbon that is present in gasoline as well as in exhaust and evaporative emissions. Benzene is also emitted from diesel engines, but at levels approximately one-fortieth that coming from gasoline vehicles. Emissions from gasoline-powered vehicles and engines contain several different toxic pollutants, including the following MSATs: benzene, 1,3-butadiene, acetaldehyde, formaldehyde, polycyclic organic matter (POM), and MTBE. However, on a mass basis, benzene makes up about 70 percent of the total amount of these gaseous toxics<sup>36</sup>. Thus if toxics emissions are going to be controlled through mobile sources, the benzene content of gasoline is an obvious area for priority consideration.

In addition to concerns about the sheer mass of benzene emissions, we are focusing on the benzene content of gasoline in this proposal because benzene emissions are one of two toxic compounds that Section 202(l) of the Act indicates must be evaluated for control. We believe that individual States and environmental organizations will support this direction since they have expressed concerns specifically about fuel benzene content and ambient benzene concentrations.

We do not believe that it is appropriate at this time to propose controls on MSATs other than benzene through fuel modifications. Our reasons for this proposed determination follow.

Benzene is one of several toxic compounds that are part of vehicle emissions as well as a component of the fuel. Because refiners are able to directly control fuel benzene levels, benzene offers refiners the greatest degree of control over a specific toxic fuel component that is also present in emissions at substantial levels.

There are, however, some gaseous toxic components of vehicle emissions which, although not components of the fuel, can be controlled through fuel property limits. These include 1,3-butadiene, formaldehyde, acetaldehyde, and polycyclic organic matter (POM). Along with benzene, all of these compounds are currently controlled under the RFG program via a toxic emissions performance standard, and are prohibited from increasing above 1990 levels under the anti-dumping program for CG. As discussed previously, we are requesting comment on a toxics performance standard as an alternative to the proposed benzene anti-backsliding program. Since a performance standard necessarily allows refiners to trade off increases in one toxic compound with decreases in another, a new toxics emissions performance standard would not necessarily result in a reduction in benzene. In fact, an emissions performance standard could actually allow increases in benzene emissions. As discussed above, we believe that benzene should be the toxic pollutant targeted for control in this rulemaking. Still, benzene emissions do

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<sup>36</sup> Per EPA's Complex Model (40 CFR § 80.45).

constitute up to 70 percent of total toxics emissions from gasoline, such that costs to control the non-benzene toxic emissions could be significant. As a result, we would expect refiners to aim for benzene control even under a new toxics performance standard, suggesting that the fuel benzene controls we are proposing today may be equivalent to the emission reductions that would be produced under a toxics performance standard. Control of these other toxics would most likely occur collectively through an emissions performance standard, and benzene would remain the primary means of toxics control in this case.

Formaldehyde is specifically listed in the CAA, along with benzene, as an MSAT that we must evaluate for control. We believe that additional controls on formaldehyde are not appropriate for today's proposal, though we will conduct further evaluation under our Technical Analysis Plan before making a determination. Formaldehyde control would require control of bulk fuel properties such as olefins or aromatics which could significantly affect octane and cost. Formaldehyde emissions are also expected to go down in the future. This means that any controls on formaldehyde may not be cost-effective, and EPA does not have enough information at this time to resolve this issue. Formaldehyde actually constitutes a significantly larger fraction of total hydrocarbons for diesel vehicles. Unfortunately, we do not have the data that would allow us to correlate individual diesel fuel properties with formaldehyde emissions. The alternative to controlling formaldehyde through diesel reformulation would be to set diesel engine standards for formaldehyde. As described above, our recently finalized Tier 2 rule and our proposed rulemaking to set new standards for 2007 model year heavy-duty engines and vehicles in fact address formaldehyde emissions from motor vehicles and heavy-duty trucks.

A number of other MSATs do not fall under the RFG or anti-dumping programs, and we do not currently have sufficient information on how changes in fuel properties affect emissions of these compounds. These include acrolein, styrene, dioxin/furans, xylene, toluene, ethylbenzene, naphthalene, and hexane. We are not aware of any model that would allow us to quantify how fuel controls could affect emissions of these compounds. We request comment or information about the effect of fuel controls on the aforementioned MSATs. We do know that bulk fuel aromatics control would reduce emissions of some of these compounds, but we are currently unable to quantify this effect. The relationship between other fuel properties and emissions of these compounds is even less clear. As a result, we cannot estimate the costs associated with controlling these compounds via fuels.

There are a number of metals that are emitted from motor vehicles, but these toxic compounds are being addressed in other actions. For instance, these metals generally arise from contaminants in lube oils. The recent rulemaking proposing new standards for heavy-duty engines and vehicles beginning in model year 2007 also proposes controls on the use of used oil as a diesel fuel additive/extender. Finally, lead is no longer allowed to be used as an additive in motor gasoline.

We are not proposing controls to address emissions of MTBE in this rulemaking, even though MTBE is on our proposed list of MSATs. The primary mechanism for

controlling MTBE emissions would be to limit the use of MTBE in gasoline. The Agency is currently pursuing a separate rulemaking under the Toxic Substances Control Act (TSCA) to consider the phase down or phase out the use of MTBE. We believe it is reasonable to defer consideration of MTBE controls to that rulemaking, which will address the important concerns of preserving water resources, as well as any air pollution impacts. In addition, the EPA and the United States Department of Agriculture jointly announced, on March, 2000, the Administration's legislative principles for protecting drinking water supplies, preserving clean air benefit and promoting renewable fuels and urged Congress to take action consistent with these principles, including providing EPA the authority significantly reduce or eliminate the use of MTBE in gasoline.

Finally, changes to diesel fuel could result in reductions in a variety of toxic compounds, including aldehydes, dioxins/furans, POM, and of course diesel PM. At this time, however, there is insufficient data to allow us to quantify how changes in individual diesel fuel properties would affect emissions of these compounds. As a result, we cannot specify how refiners might change their operations or what capital equipment they might need to install in order to reformulate their diesel fuel, and thus we cannot estimate costs associated with this type of control. We request comment or information regarding the effect of diesel fuel reformulation on toxics emissions.

#### **C. Given the Existing Over-compliance, Why Is EPA Considering Additional Gasoline Benzene Controls?**

Absent regulatory changes affecting toxic emissions and/or oxygenates, or reduction in the petrochemical demand for benzene, EPA expects that this average level of over-compliance will continue. Benzene emissions are critically dependent upon exhaust VOC control, which should continue to improve over the next 4-5 years due to the introduction of NLEV and Tier 2 vehicles. However, current benzene emission reductions are not guaranteed to continue. Therefore, because of the potential for serious health effects associated with air toxics from gasoline, EPA is proposing a toxics control program to maintain current benzene levels by creating an anti-backsliding program. Because it is an anti-backsliding program, it is not designed to reduce gasoline benzene content or benzene emissions beyond today's levels. However, it would prevent benzene emissions from increasing during the time period that we will be considering the need for and appropriateness of additional fuel-based toxics control programs.

#### **D. What Type of Gasoline Control Program Is EPA Proposing Today?**

The program EPA is proposing today focuses solely on gasoline benzene control and would require that a refinery's annual average gasoline benzene content not exceed the refinery's average gasoline benzene content during a baseline time period. We consider this approach to be an "anti-backsliding" measure, in that it does not allow gasoline benzene levels to increase, or "backslide," relative to the baseline. This section provides an overview of our proposed benzene control program while Section H provides a more detailed discussion of the specific requirements of the program. We are also taking comment on an alternative approach involving a toxics emissions performance



standard, which is described more fully in Section I.

We are proposing that the benzene control program would begin in 2002. We believe this is an appropriate start date because refiners already have all of the information needed to establish their benzene baselines (see the baseline time period discussion below). Also, since the standards are intended to maintain 1998-1999 levels of over-compliance with benzene standards for RFG, and 1998-1999 benzene levels in CG, and thus are not technology-forcing, no lead time for capital equipment installation is necessary. As a result, gasoline benzene levels can be controlled at the earliest practical date. While we considered other effective dates, we believe the 2002 date is most practical. This is because the standards will not be finalized until December 2000, it will take several months for refiners to have their baselines approved, and it is desirable to have the program start on January 1. Therefore, 2002 is the earliest practicable effective date. We request comment on a start date of 2002.

We are also proposing that these benzene requirements would apply separately to federal RFG and CG. This is consistent with the separate treatment of these two gasoline types under the RFG and anti-dumping programs, and ensures that the benzene is not “moved” from one pool to the other to achieve compliance. As described more fully in Section V.F.1 below, the proposed benzene anti-backsliding standards would apply only to a volume equal to the average of volume of gasoline produced during the baseline years (i.e., 1998-1999). The Agency is taking comment on the appropriate standard to apply to any incremental gasoline that a refinery may produce beyond the amount of gasoline produced as an annual average in 1998-1999.

We are proposing a baseline time period of January 1, 1998 through December 31, 1999 (“1998-1999”). Thus, a refinery’s baseline benzene content would be the average benzene content of all the gasoline produced during the two-year time period from 1998-1999. As an alternative, we could also choose a different pair of baseline years, such as 1999-2000, or a longer time frame, such as 1997-1999. Phase II RFG went into effect in January of this year, and the Agency is interested in public comment on the appropriateness of using the year 2000 as part of its benzene baseline. We request comment on the proposed baseline period (1998-1999), on alternative baseline periods, and specifically ask commenters to address the Agency’s concerns pertaining to using the year 2000 in an alternative baseline.

Substantial emissions reductions have accrued as a result of the RFG program, and more are expected with the introduction of Phase II RFG. EPA has a significant interest in ensuring the continued production of RFG by domestic and foreign refineries. The proposed anti-backsliding standards for RFG and CG may have an impact on the future production of RFG, particularly for those refiners that are interested in expanding production or entering the RFG market for the first time. The Agency as described more fully in Section V.F.1 below, is requesting comment on separate treatment of incremental volumes of RFG above baseline volumes based on 1998-1999 production.

Despite the fact that our proposed anti-backsliding program uses a two-year averaging period to establish baselines, we have chosen to propose a one-year averaging period for compliance purposes. The one-year averaging period is consistent with that

used in the RFG, anti-dumping, and upcoming gasoline sulfur programs. It therefore represents a minimal additional reporting burden for refineries and importers. It also ensures that temporal variations in ambient benzene concentrations due to varying fuel benzene content are kept to a minimum; a two-year averaging period, for instance, might allow fuel benzene levels in one year to be significantly higher than in the following year. Nonetheless, we request comment on the two-year averaging period option for compliance purposes, and on any other options which will maintain the anti-backsliding benefits of the proposed program.

EPA recognizes that some fluctuations in benzene levels may occur from one year to the next for a given refinery even if no long-term trend upward or downward is evident for that refinery. We are proposing that the baselines be applied to every single year after 2001 even though year-to-year fluctuations might push some refiners' benzene levels above their applicable standard in any given year. In response to this possibility, we are proposing a one-year deficit carryover provision. This provision would ensure that a refinery can meet its benzene standard while still allowing for the year-to-year fluctuations that may arise in the course of gasoline production. Therefore, our proposed program would give refineries maximum flexibility to comply with our anti-backsliding program. We request comment on this proposed approach.

Finally, we have chosen to propose an anti-backsliding program which controls gasoline benzene levels instead of a control which focuses on air toxics performance for two reasons. First, total benzene emissions constitute up to 70 percent of total toxics emissions (exhaust benzene emissions constitute roughly 65 percent of total exhaust toxics emissions). As a result, refineries would most likely focus on gasoline benzene control even if we proposed an equivalent toxics emissions performance standard. Second, gasoline benzene control also avoids the potential for offsetting benzene emissions increases with decreases in some other toxic pollutant such as 1,3-butadiene, formaldehyde, sulfur, or acetaldehyde. At the same time, there are a number of reasons why a toxics performance standard approach may also be desirable, and therefore, we are taking comment on it as an alternative anti-backsliding approach. This alternative toxics performance standard approach is described in more detail in Section I.

#### **E. Will the Proposed Benzene Standards Preempt State Benzene Controls?**

As EPA has explained in its federal fuel rulemakings, including in the preambles to the Tier2/sulfur gasoline rule and 1994 RFG rules, where EPA has adopted controls under section 211(c)(1) on the characteristics or components of gasoline provided to a particular area, section 211(c)(4)(A) of the Clean Air Act generally prohibits States from adopting their own controls respecting those characteristics or components unless the State controls are identical to EPA's.<sup>37</sup> Thus, EPA recognizes that by adopting specific

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<sup>37</sup> Section 211(c)(4)(A) provides:

Except as otherwise provided in [211(c)(4)(B) or (C)], no state (or political subdivision thereof) may prescribe or attempt to enforce, for purposes of motor

controls on benzene content, as is proposed today, there is little question that States would be preempted pursuant to 211(c)(4)(A) from adopting their own benzene controls for gasoline subject to the federal benzene standard.

EPA recognizes the concerns associated with the potential disruption caused by numerous “boutique” fuels (i.e., state- and area-specific fuel types). In most situations, EPA believes that a uniform national program best balances protection of public health and protection of an efficient fuel distribution network. As the number of boutique fuels increases the less efficient the distribution system become. Therefore EPA’s general expectation is that State fuels that differ from federal standards should be limited to situations where local or unique circumstances warrant control.

Today’s proposal, however, is different from our previous fuel controls in two important respects. First, today’s proposal, unlike many of our controls such as the federal sulfur regulations and the benzene standard for RFG, would not impose a uniform national standard that ensures significant emissions reductions in all areas of the country. EPA expects that under the proposed refinery-by-refinery standards, gasoline benzene levels around the country would not change from where they are today. This is particularly significant for areas receiving conventional gasoline where the average benzene levels are higher. In addition, several conventional gasoline areas in the country currently receive gasoline with benzene levels well above the national average.

Today’s proposal also differs from many of our federal fuel controls such as the Tier 2/sulfur rule and our gasoline volatility program, in that it addresses a toxic component of gasoline, as compared to a fuel component that adversely affects efforts to achieve a NAAQS. This is important because section 211(c)(4)(C) of the Act allows for a waiver of preemption of state standards only where necessary to achieve a NAAQS. A similar mechanism is not clearly provided for States seeking to control ambient concentrations of toxics in their areas.

Thus, without some regulatory mechanism, this proposal could have the effect of preventing States from addressing local toxics concerns under all circumstances because a waiver may not be available. We therefore believe it is appropriate to consider options that would allow States to adopt more stringent conventional gasoline benzene standards in areas with higher than average benzene levels. EPA seeks comment on two alternatives.

One alternative would be to define the applicability of the rule such that the federal conventional gasoline benzene standards proposed today would not apply to gasoline intended for and used in States where the State adopts more stringent benzene controls under a benzene control program submitted to EPA for approval. Under this

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vehicle emissions control, any control or prohibition respecting any characteristic or component of a fuel or fuel additive in a motor vehicle or motor vehicle engine . . . if the Administrator has prescribed under [211(c)(1)] a control or prohibition applicable to such characteristic or component of a fuel or fuel additive, unless the State prohibition or control is identical to the prohibition or control prescribed by the Administrator.

approach, State benzene controls that are more stringent than the federal standard would not be preempted by the benzene standard proposed today. This would facilitate the ability of States to adopt more stringent conventional gasoline benzene standards. It is important to note that this provision for more stringent State benzene controls would apply only to conventional gasoline areas. States in RFG areas would continue to be subject to the current federal benzene standard for RFG, which was issued under section 211(c)(1), as well as the benzene standard proposed today.

Under this approach, the regulations would establish a process analogous to the waiver process provided in section 211(c)(4)(C) of the Act and provide criteria that must be met before a State could adopt and enforce a more stringent standard. For example, the regulations could require the state to establish the following: that areas within the state are experiencing benzene air pollution problems and that there is a reasonable basis for the State's determination that there is a public health need for additional controls; how benzene levels in gasoline impact air quality; and that the standards and lead time provided in the state plan are reasonable and practicable considering factors such as cost and supply impacts. We request comment on all of these criteria and invite suggestions for other criteria that we could use.

Under this approach, the State would also need to demonstrate that the State control is more stringent than the applicable federal requirement. We have considered several options for making this demonstration, and request suggestions for other means of comparison. One difficulty is that EPA's proposed program would control benzene at the refinery and importer level while any State standards would apply to a geographic area. In many cases, gasoline distributed in a given area may not have been produced by a refinery in the area; in fact, the refinery could be hundreds of miles from the area. One option we have considered for determining whether a State program is more stringent is to evaluate whether it would get more benzene control than today's proposed program. A State could determine the gasoline benzene levels in the area, and make predictions of any changes in those levels with the State program. This would require estimating the range of gasoline benzene levels in gasoline supplied to the area under the federal program, and any differences in the gasoline benzene levels that would result from a State program. Another option would require a State standard to be as low (in benzene) as the cleanest refinery baseline of the refineries most likely to supply the area.

EPA believes this first alternative would be a reasonable exercise of EPA's discretion under 211(c)(1), because a federal backstop is not needed to avoid degradation in benzene levels in those areas where a State has adopted more stringent controls. Where a State adopts a more stringent benzene control for conventional gasoline sold in its area, it may request the EPA to remove the proposed federal benzene standard applicable to such gasoline. If EPA finds the State standard is in fact more stringent than the federal requirement otherwise applicable to gasoline intended for and used in that area and that the regulatory criteria are satisfied, the federal control would no longer be applicable to conventional gasoline used in that area. Because no federal benzene standard would apply to gasoline used in the area regulated by the State control, the State

control would not be preempted by today's proposed federal benzene standard.<sup>38</sup>

EPA believes this approach is consistent with the authority provided in section 211(c)(1). Section 211(c)(1) authorizes EPA to determine both the level of control that is appropriate as well as the product to which the control should apply. EPA believes it is appropriate that this federal program, which is designed to avoid backsliding, should not interfere with State authority to adopt controls that are more stringent. This approach is similar to the scheme outlined in 211(c)(4), which allows EPA to approve otherwise preempted State fuel controls into the State Implementation Plan (SIP) if the controls are needed to help achieve one or more of the NAAQS. This alternative provides a mechanism for waiving preemption of State benzene controls that is otherwise missing in 211(c)(4).

A second alternative would be to avoid preempting State benzene controls in conventional gasoline areas in the first instance. This could be accomplished by establishing a control, on a refinery-by-refinery basis, based on the overall exhaust toxics performance rather than specifically on benzene levels. As with benzene, many refiners currently produce conventional gasoline that over-complies with the individual baselines for exhaust toxics performance assigned to each refinery. Much of this over-compliance, as explained earlier, is the result of lower benzene levels in gasoline. A more stringent exhaust toxics performance standard, like the proposed benzene standard, would ensure maintenance of this recent performance (in most cases over-compliance) but would not specify how that level of performance is to be achieved.<sup>39</sup> Like the refinery-by-refinery

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<sup>38</sup> EPA believes that if a particular federal control does not apply to gasoline used in a given area, that federal control should have no preemptive effect in that area under section 211(c)(4)(A). Thus, to determine the scope of federal preemption in conventional gasoline areas, EPA would only consider the conventional gasoline controls. The current conventional gasoline exhaust toxics performance standards, described in more detail below, use benzene as one of the inputs in the model used to evaluate the performance of a particular gasoline formulation. The level of benzene is not itself limited by any federal regulation for conventional gasoline. EPA believes it is reasonable to conclude that section 211(c)(4)(A) does not prohibit States from controlling benzene in conventional gasoline based on either the current conventional gasoline (CG) standards, or under today's proposal, where EPA's benzene control does not apply to that gasoline.

<sup>39</sup> The conventional gasoline toxics performance standard requires that exhaust toxics performance of current fuels be no less than the individual baseline, which was based on the performance of the gasoline produced in 1990. The performance of gasoline is modeled using EPA's Complex Model. The inputs used by the Complex Model to evaluate exhaust toxics performance for conventional gasoline include the levels of benzene, MTBE, ETBE, ethanol, aromatics, olefins, sulfur, RVP, and oxygen, as well as distillation values (E200 and E300). By regulating performance rather than the individual parameters that affect performance, the regulations give refiners flexibility in determining their fuel formulations, and preserve overall performance even if specific fuel characteristics vary.

benzene standard being proposed today, a refinery-by-refinery exhaust toxics performance standard that reflects the recent level of performance achieved by that refinery would impose only negligible costs on refiners, if any. Moreover, because EPA would be regulating exhaust toxics performance and not benzene content, State benzene controls may not be preempted.<sup>40</sup>

EPA invites comments on the need to consider the above options for avoiding presumption of State controls, as well as the advantages and disadvantages of both of these approaches, including the potential preemptive effect of the approaches, and estimates of any costs associated with each of the approaches.

We would expect that refiners would likely segregate such State fuel in order to comply with the State control. We invite comment on whether EPA should require segregation to ensure that batches of gasoline that were not intended to be State batches would not be labeled as such simply to avoid including them in a refinery's compliance determination for today's proposed program. By ensuring that gasoline is correctly accounted for and ultimately correctly distributed, the environmental goals of the federal and State programs are met. We request comment on this issue of segregating State gasoline, including the feasibility and practicality of such an approach and the impacts of distribution of a separate State gasoline.

#### **F. What Are the Expected Impacts of EPA's Proposed Program?**

##### **1. Expected costs and benefits**

EPA believes that no refinery capital expenditures or operational changes would be needed to comply with the proposed anti-backsliding program since the proposal only requires that refineries continue doing what they did during 1998-1999 in terms of gasoline benzene content.

Refineries with low 1998-1999 benzene levels may believe that the proposed rule is penalizing them for being "cleaner" than required with respect to fuel benzene content. While EPA appreciates the fact that these refineries were indeed cleaner than necessary, EPA believes that refineries in 1998-1999 were likely to be operating in a manner that optimized their operations. Thus, the over-compliance during that time period must have been the most comfortable operating position for refiners. Individual refiners whose gasoline contained very low levels of benzene must have been maximizing profits in the same way as refiners whose gasoline contained higher levels of benzene. Thus, there is no clear unfairness to setting standards for all refiners according to this optimized level, which had little year-to-year variation even over the three year period beginning in 1997.

#### **Discussion of Incremental Volume Impact**

The Agency recognizes that the demand for RFG is projected to increase over time, approximately 2% per year based on VMT projections. This raises an issue whether additional or different costs may be associated with this additional production to meet an

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<sup>40</sup> A state control on benzene would not be a control "respecting" exhaust toxics, for purposes of section 211(c)(4)(A).

increase in demand. EPA invites comment on this issue. The proposed benzene standards apply only to the annual average volume of RFG produced in the baseline years. The Agency intends to regulate the additional incremental production of RFG and discusses options below. However, at this time we are not proposing a specific course of action and will take all comments into consideration when determining the appropriate standard to apply to the incremental RFG production in the final rule.

Specifically, EPA invites comment addressing four separate scenarios of potential increases in production of RFG: The first scenario would arise through increased production by refiners who currently produce RFG. These refiners may have current excess capacity and would expand their RFG production to meet rising demand. These refineries have established operations. They would have a baseline for their current production. The second scenario is refiners who might start producing RFG in the future. Some refiners who currently are only producing CG may decide to convert some of their production to RFG. They would not have an established baseline for the RFG production. The third scenario is importers, who are somewhat different since they often have no access to refining capacity themselves. Established importers would have a baseline. Therefore, to increase volume over the baseline volumes importers may have to find additional sources of RFG. That may cause them to seek additional volume from a new refining entity with benzene levels different from the established baseline. The last scenario consists of new refineries and importers who would not have established baselines. For each of these situations, EPA invites comment on costs associated with this increased production compared to costs with current production levels, information of the relative impacts on supply if any, and the predicted benzene levels of this increased production.

EPA seeks comment on two basic options for establishing a benzene standard for this increased production and requests ideas on other options that may be appropriate. Information received in the above request for comments will be useful to EPA in deciding the appropriate approach to take in setting a standard for this increase in production volume. EPA also invites comment on the relative merits of both approaches as applied to the different situations described above.

The first option would apply the same benzene content standard to all production. In other words, existing RFG refiners and importers that choose to expand production/importation would include all RFG produced in determining compliance with their 1998-1999 baseline benzene average. New RFG producers would need to meet the average benzene content currently found in the national RFG pool (i.e., 0.66 vol%). This first option would ensure that the average benzene content of RFG would not degrade in the future.

The second option would set a separate standard that would apply only to the

additional volume of RFG produced by a refinery or importer.<sup>41</sup> For these new barrels of RFG, EPA could require that the gasoline meet a less stringent standard, but no less stringent than the current RFG benzene standard of 0.95 vol% on average. This approach would preserve the benzene reductions that have been achieved to date for the existing inventory of RFG, while potentially allowing some limited increase above this level for the small amount of increased production. EPA requests comment on how benzene levels under this option are likely to compare to those that would be achieved under the first option.

### **Potential Interaction with Tier 2/Sulfur Gasoline Program and Possible MTBE Action**

EPA is also seeking comment on the potential interaction, if any, of today's proposal with the promulgated Tier 2/sulfur reduction program and possible MTBE gasoline control programs. Regarding Tier 2 interaction with this proposal EPA, seeks comment on whether the implementation of Tier 2/sulfur there may lead to future compliance costs associated with this proposal. In addition to comments regarding potential costs differences, EPA requests comment on alternative benzene content standards that commenters believe would be appropriate under these circumstances and other alternative scenarios identified by commenters. EPA also seeks comment as to what extent, if any, the proposed benzene controls would affect the costs associated with future controls of MTBE content of gasoline. This information will be used to inform the Agency in its ongoing deliberations on the MTBE issue.

With regard to benefits, our proposed anti-backsliding program is not expected to reduce toxics emissions beyond what is currently being achieved. Instead, we would expect it to hold the average content of benzene in gasoline to 1998-1999 levels (gasoline in 2002, for example, would have the same benzene content, on average, as gasoline in 1998-1999 ). Because compliance with the proposed requirements would be determined at the refinery, and because fuel from a given refinery tends, on average, to be sold in a few specific areas (excluding fungible pipeline shipments), areas with relatively high gasoline benzene levels would be likely to continue to have relatively high gasoline benzene levels, unless a refiner voluntarily reduced its gasoline benzene content below its baseline levels. Fleet turnover to vehicles with lower standards (in other words, LEVs and Tier 2 vehicles) is expected to lower emissions of toxic compounds even as VMT increases, so benzene emissions will in fact continue to decrease, independent of our proposed anti-backsliding program.

#### **2. Applicability of the anti-dumping program**

National Petrochemical & Refiners Association (NPRA) recently wrote to us requesting that we consider repealing the gasoline anti-dumping program which was

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<sup>41</sup> Under this option we would need to establish not only a refinery-by-refinery baseline benzene content standard but also a refinery-by-refinery baseline on the volume of gasoline produced. Presumably these baselines would be based on the same time period.



established as part of the 1990 Clean Air Act Amendments<sup>42</sup>. A copy of this letter is included in the docket for this rule. The anti-dumping regulations require that each refiner's conventional gasoline, starting in 1995, produce no more emissions of NOx and exhaust toxics emissions than were produced by that refiner's 1990 gasoline. The primary purpose of the program was to prevent increased emissions from consumption of conventional gasoline due to the production of cleaner-burning reformulated gasoline.

NPRA believes that the combination of the Tier 2 sulfur controls, which begin phasing in by 2004, and the benzene standard being proposed today would on their own ensure compliance with the anti-dumping standards for NOx and exhaust toxics emissions. In other words, with sulfur levels controlled to 30 ppm on average and benzene levels capped at current levels (which on average are less than those existing in 1990), refiners could not modify other gasoline parameters in order to violate their 1990 baseline standards for these two pollutants.

We request comment on the appropriateness of revising the anti-dumping program after full implementation of the Tier 2 sulfur controls and the benzene standards being proposed today. We also request comment on retaining the anti-dumping program, but waiving the testing and reporting requirements for all refiners and importers after implementation of the sulfur and benzene programs. Finally, we also request comment on the need to require further reductions in fuel benzene levels beyond those being proposed today before waiving the testing and reporting requirements associated with the anti-dumping program, to ensure that the waiver does not relax the current anti-dumping requirement for toxics.

**G. Determination of the Need for Future Controls Deferred to Technical Analysis Plan and Future Rulemaking**

In today's action we are not proposing to reduce the benzene content of gasoline below 1998-1999 levels. Although EPA has started to evaluate the emission benefits, costs, and technical issues associated with reducing fuel benzene levels below 1998-1999 average levels, a more precise evaluation of these issues cannot be made without much of the information that would be developed in the proposed Technical Analysis Plan. We are deferring a determination of the need for and appropriateness of additional controls related to benzene or other toxics until such time as more information is available.

Since reductions in fuel benzene content can produce substantial reductions in benzene emissions, fuel benzene control is a good approach to fuels-based toxics control. There are many ways of reducing gasoline benzene content. In fact, through our discussions with refineries and licensors of benzene reduction technology, we have identified four basic strategies that refineries could use to reduce benzene levels in their gasoline. The first strategy routes the precursor compounds (i.e., those compounds that tend to form benzene in the reformer<sup>43</sup>) around the reformer. The second strategy

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<sup>42</sup> See EPA Air Docket A-2000-12, document number II-D-02.

<sup>43</sup>A reformer is a refinery operating unit which produces a gasoline blending stream known as reformat. Reformat is very high in aromatics, such as benzene, and reformat is the

separates a benzene-rich stream from reformat, the reformer product, and saturates<sup>44</sup> the benzene. In the third strategy benzene is separated from the reformat for sale to the petrochemical market. The fourth strategy involves separating either the benzene precursors or the benzene-rich product and other light compounds from the reformat, and saturating the benzene in an isomerase unit. While the first three strategies result in a net octane loss in the gasoline pool, the last strategy recovers that octane loss and can even increase the gasoline pool octane level. These and other potential benzene reduction strategies would be investigated in our Technical Analysis Plan.

In evaluating further mobile source air toxics, we will consider the appropriateness of both potential new controls and existing controls, considering costs and other relevant factors. Benzene reduction technologies (and in general, toxics reduction technologies and strategies), and how to best estimate the inventory benefits of additional control measures, are two areas for which we believe additional information is needed. Therefore, as mentioned above, we are deferring any further regulatory decisions until we can conduct our Technical Analysis Plan.

It should be noted that there are clear advantages in deferring a decision regarding the need for and appropriateness of further mobile source air toxics controls. As the gasoline and proposed diesel sulfur control programs are phased-in over the next few years, we can consider the effects of those programs, for example, the refinery impacts, as we estimate the costs and benefits of further controls. Also, currently there are significant data gaps in our nonroad emissions estimates and uncertainty in our estimated toxics inventories. We will be in a better position to address these limitations over the next few years. Furthermore, the nationwide benzene inventory will continue to decrease over time due to other programs, ensuring that adverse health effects associated with exposure to benzene will continue to decline. In the meantime, our proposed anti-backsliding provisions would prevent increases in the benzene content of gasoline. We also believe that within the next few years, additional data on ambient toxics levels will provide us with important information in evaluating further mobile source air toxics policy decisions.

#### **H. What Are the Details of Today's Proposed Program?**

This section explains the proposed benzene requirements, who must comply with the proposed standards, what gasoline is subject to the requirements, a possible credit banking and trading program, and compliance provisions.

##### **1. Standards and dates**

We are proposing that each refinery and importer be assigned an individual baseline benzene value, separately for their reformulated and conventional gasolines, based on the quality of the gasoline produced or imported during the two-year period from 1998 through 1999. We are proposing that, beginning January 1, 2002, during each

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main source of benzene and aromatics in finished gasoline.

<sup>44</sup> When benzene is saturated, hydrogen is added to the molecule to transform it from an aromatic compound to cyclohexane.

annual averaging period, the average benzene content for each type of gasoline listed above may not exceed the baseline benzene content for that type of gasoline for that refinery.

We are proposing a one-year deficit carryover which would permit refiners some flexibility in meeting their 1998-1999 baseline benzene levels. Under this flexibility, a refinery or importer would be allowed to be out of compliance with its benzene baseline for one year, but would have to make up the deficit and be in compliance the next year. EPA requests comments on this proposal and on a two-year averaging option wherein a refinery or importer's compliance would be determined every two years. EPA specifically requests comments on the potential environmental harms and costs or cost savings under such an option.

We request comment on whether the proposed 1998-1999 baseline is an appropriate baseline time period, and whether there would be any difference in requiring 1997-1998 to be the baseline period, or perhaps even a three-year baseline time period, 1997-1999, or some other time period. We specifically request comment on the year-to-year variability in a refinery's gasoline benzene levels. We also request comment on the option of allowing a refinery to petition for a different baseline time period, if, during a portion of the baseline time period, refinery operations were significantly different from average operations, barring normal maintenance and turnarounds.

We also request comment on whether the proposed start of the program (January 1, 2002) allows sufficient time for refiners to prepare to meet the proposed requirements. We believe the proposed start date is appropriate since the requirements aim to capture recent performance as opposed to forcing further reductions. Because the proposed standards are average standards, which inherently allow batch-to-batch variability, we are not including compliance cushions in the setting of the gasoline benzene standard from each refinery's RFG and CG standard. There were no compliance cushions used in either the anti-dumping program or the RFG annual average benzene standard.

2. Entities subject to the proposed regulation

The proposed benzene control program would apply to anyone who produces or imports gasoline for sale in the U.S., primarily petroleum refiners and importers. This includes anyone meeting our definition of a refiner (including blenders, in most instances) or an importer. Foreign refiners would in some cases be treated as a refiner.

3. California gasoline

We are proposing that the requirements of the proposed benzene control program not apply to California gasoline. This is because California currently has a gasoline benzene standard that is more stringent than that required by the federal RFG program. Under California's program, a California refinery's annual average gasoline benzene content cannot exceed 0.8 vol%. This standard is more stringent than the federal RFG standards, which require that a refiner's RFG benzene not exceed 0.95 vol%, on average. California maximum benzene levels (on any batch subject to the averaging standard) are also more stringent than the federal RFG requirements. The current California maximum is 1.2 vol%, which will decrease to 1.1 vol% in 2003. The federal RFG maximum benzene level is 1.3 vol%. In 1998, California gasoline averaged less than 0.6 vol%.

This average is below the current 0.65 vol% annual average for non-California, federal RFG. Additionally, beginning in 2003, California gasoline will become subject to a more stringent (refinery-based) benzene requirement of 0.7 vol% annual average. Given this upcoming reduction in the California averaging standard to a 0.7 vol% annual average, we do not expect average California gasoline benzene levels to increase.

While it is possible that California gasoline benzene levels could backslide compared to the levels in the baseline period, such a backslide is highly unlikely, or would be extremely minimal, given current California benzene levels and the upcoming more stringent standards. The goal of today's proposed program is to ensure that gasoline benzene levels around the country do not increase compared to the gasoline benzene levels during the baseline time period. We do not believe that excluding California from today's proposed program conflicts with this goal, and we do not expect any environmental detriment in California or the other 49 states as a result of excluding California gasoline from the proposed requirements.

This exclusion for California gasoline is consistent with other EPA fuel controls. California gasoline is currently excluded from some or all of the requirements of the RFG, anti-dumping, and gasoline sulfur programs. In the final RFG and anti-dumping rule [59 FR 7716, February 16, 1994], EPA exempted California refineries from most of the enforcement mechanisms, including reporting, associated with those programs because 1) California gasoline exceeded the federal performance standards for RFG; 2) the federal RFG areas in California were assured of meeting the federal RFG performance and content (benzene and oxygen) standards; and 3) the compliance and enforcement program was sufficiently rigorous. This exemption was extended for federal RFG Phase II [64 FR 49992, September 15, 1999]. EPA has also exempted California gasoline from the recently promulgated gasoline sulfur requirements associated with the Tier 2 emission standards [65 FR 6698, February 10, 2000] because the current California gasoline sulfur requirement is at least as stringent as the new federal sulfur requirement.

Because it would not be included in the proposed program, we are proposing that California gasoline be segregated for the proposed benzene program as well as the other federal fuel programs. Though most California gasoline is produced and used in California, some is imported to or exported from California, and under the RFG and anti-dumping rules, such gasoline must be segregated and separately accounted. Segregation will ensure that low-benzene California gasoline is not part of a non-California refiner's benzene compliance determination, which would otherwise allow the refiner to use the low-benzene California gasoline to offset higher benzene gasoline destined for areas other than California.

We request comment on whether California should be excluded from the requirements of this proposed rule. If California gasoline were subject to today's proposed rule, it would be considered a separate type of gasoline for baseline and compliance determinations, just as we have proposed separate determinations for RFG and conventional gasoline.

4. Proposed baseline development and submittal requirements
  - a. **General requirements**

The purpose of establishing a benzene baseline for each refinery or importer is to determine the standards for that refinery under today's proposed rule. Each refinery or importer will have a reformulated gasoline benzene baseline value and a conventional gasoline benzene baseline value to the extent they produced or imported these fuels in the 1998-1999 baseline time period. We propose that refiners and importers would have to establish these benzene baselines for each individual refinery by submitting to us data establishing their annual average gasoline benzene levels based on the average of their 1998 and 1999 operations. No additional sampling or testing is required to establish a benzene baseline since this information is already required for both the reformulated gasoline and anti-dumping programs. We would review the data, and barring any discrepancies, approve benzene baselines for each refinery or importer.

We believe the process we have defined would minimize the burden to the industry and the time it will take for us to review and approve the benzene baselines. Specifically, refiners and importers must submit to us information which establishes (separately for RFG and CG) the batch report numbers, benzene levels and volumes of each batch, or composite, as applicable, of gasoline produced or imported in 1998 and 1999, as well as the annual average benzene levels calculated from this data. Within 120 days, we will review the application and notify the refiner of approval or of any discrepancies we find in the data submitted.

We are proposing that benzene baselines be submitted no later than June 30, 2001. EPA believes this would provide the industry with sufficient preparation time, and the Agency adequate review and approval time. EPA requests comment on whether this deadline for benzene baseline submittals is appropriate.

**b. Proposed requirements for foreign refiners**

We are proposing that foreign refiners may follow the general requirements of our protocol for establishing individual refinery baselines (see 40 CFR §§ 80.91-94 and also 40 CFR § 80.410) by providing sufficient data to establish the volume of gasoline imported to the U.S. in 1998-1999 and the annual average benzene level of that gasoline. If the test method used to identify the benzene levels differs from the one specified in today's proposed action, the refiner would have to provide sufficient information about the test method to allow us to evaluate the appropriateness of the alternative. Because this information will be new to us, we may require more time to review and approve their 1998-1999 benzene baseline. But, consistent with our previous handling of foreign refiner submissions, once we have determined that the submission is complete, and the protocol has been followed, the foreign refiner may use the baseline while awaiting our formal approval. However, the refiner would be held to the baseline that is ultimately approved.

**c. Proposed requirements for importers and blenders.**

To establish an individual benzene baseline, importers and blenders must have information on every batch of gasoline for at least twelve consecutive months within the two baseline years. Absent this data, we propose that they be assigned the industry average gasoline benzene baseline for that pool of gasoline.

**d. Proposed requirements for those with incomplete 1998-1999 benzene data**

Certain regulated parties did not produce or import gasoline into the U.S. during some or all of 1998-1999. EPA is proposing the following methodologies of determining the benzene baselines for these parties for the purposes of the proposed benzene control program:

- 1) Produced or imported for 12 consecutive months or more during the time period 1998-1999. EPA is proposing to accept, at a minimum, 12 consecutive months' worth of data (which must include every batch produced or imported during that time period); any additional data (of acceptable quality) for the remainder of the baseline period must also be included in the determination.
- 2) Produced or imported for less than 12 consecutive months during 1998-1999. EPA is proposing that refineries and importers in this situation use the 1998-1999 industry averages (separately for RFG and CG) as their 1998-1999 benzene baseline. We have estimated these values to be 0.66 vol% for RFG and 1.11 vol% for CG.

**e. Aggregation of refinery benzene baselines**

Consistent with the anti-dumping program, and with our position to maintain current performance with today's proposed action, we are proposing that multi-refinery refiners and importers be required to comply with the requirements of this proposal for their conventional gasoline on the same aggregate basis as their anti-dumping compliance is determined. Thus, each aggregate of a refiner would have a baseline conventional gasoline benzene level, computed after determining the baseline conventional gasoline benzene level of each refinery in the aggregate.

5. Flexibility provisions

**a. Credit program**

This proposed anti-backsliding program does not include a credit trading program. However, EPA is seeking comment on the need for and viability of a credit trading program such as outlined below. While the agency believes it has provided sufficient flexibility with the proposed deficit carryover program, we are seeking comment on this credit trading approach as an alternative, or additional, means of providing compliance flexibility.

The current Reformulated Gasoline Rules provide a credit program that allows the transfer of benzene credits by refiners, importers, and blenders (see 40 CFR 80.67). In this program, benzene credits can be generated from a baseline average of 0.95 vol% benzene. This program will remain in place. Refiners that currently rely on this program, if any, will continue to be able to use it in meeting the basic RFG requirements in 40 C.F.R. subpart D.

This credit generation and transfer approach could also be incorporated in the proposed anti-backsliding benzene standard. Refiners could generate credits by reducing the average benzene in their product below the anti-backsliding baseline. Under such a trading program, compliance could be achieved through a transfer of benzene credits provided that (1) the credits are generated in the same averaging period as they are used; (2) the credit transfer takes place not later than 15 working days following the end of the

averaging period in which the benzene credits were generated; (3) the credits were properly created; and (4) the credits are transferred directly from the refiner, importer, or blender that created the credits to the refiner, importer, blender that used the credits to achieve compliance (i.e., no brokering of credits).

Based on the fact that RFG and CG would have separate baselines, EPA believes it would be inappropriate to allow credit trading between the RFG and conventional gasoline pools. We request comment on the need for and appropriateness of adopting this type of credit program in the proposed anti-backsliding standard for both the reformulated and conventional gasoline pools. We are also seeking comment on whether any additional constraints might be included to limit credit transactions to ensure that the average benzene levels supplied to a given area do not degrade.

#### **b. Hardship provisions**

EPA is proposing to allow a refinery to temporarily produce and distribute gasoline which will cause it to exceed its baseline benzene level at the end of the averaging period based on the refiner's inability to produce complying gasoline because of extreme and unusual circumstances outside of the refiner's control that could not have been avoided through the exercise of due diligence. EPA is proposing to follow the "extraordinary circumstances" provisions as presented in 40 CFR § 80.73 of the reformulated gasoline rule. EPA does not believe that the proposed benzene control program presents significant compliance challenges or compliance costs to the refiners. Thus, we are not proposing to include hardship provisions such as those included in the gasoline sulfur program for extreme economic hardship.

#### **6. Downstream standards**

Compliance with today's proposal occurs at the refinery or importer level, since each refinery, aggregate of refineries, or importer must comply with its average 1998-1999 baseline. As a result, there are no downstream standards associated with today's proposed rule.

#### **7. Sampling and testing**

Overall we believe that our proposed anti-backsliding program will require refiners and importers to do little or no more than they are currently doing under the existing RFG and anti-dumping programs in terms of sampling and testing. The specific requirements are discussed below.

##### **a. Test method for benzene in gasoline**

We are proposing that ASTM standard method D3606-99 Standard Test Method for "Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography" be used for the measurement of benzene in gasoline. This is the most recent update of this methodology.

##### **b. Requirement to Test Every Batch of Gasoline Produced or Imported**

We propose that the applicable per-batch or composite sampling and testing, as applicable for RFG and conventional gasoline, be continued under our proposed benzene control program. Since this program is only concerned with the annual average benzene

level, there is no need for more batch testing than is already required.

**c. Sampling Methods**

Sampling methods apply to all parties who conduct sampling and testing under the rule. We propose to require the use of sampling methods that were proposed in the July 11, 1997 Federal Register notice for the RFG/CG rule (62 FR 37338, at 37341-37342, 37375-37376). These sampling methods include ASTM D 4057-95 (manual sampling), ASTM D 4177-95 (automatic sampling from pipelines/in-line blending), and ASTM D 5842 (this sampling method is primarily concerned with sampling where gasoline volatility is going to be tested, but it would also be an appropriate sampling method to use when testing for benzene).

**d. Gasoline Sample Retention Requirements**

EPA is proposing to retain current gasoline sample retention requirements.

**8. Recordkeeping and reporting requirements**

Under today's proposal, refiners and importers would be required to keep, and make available to EPA, certain records that demonstrate compliance with their benzene baseline standard. The RFG/CG regulations currently require refiners and importers to retain records that include much of the information required in this proposed rule. Where this is the case, there would be no requirement for duplication of records or information.

Since there are no downstream standards under the proposed benzene regulations, only refiners and importers would be required to retain Product Transfer Documents (PTDs) and records of quality assurance programs (including, where applicable, benzene test results). Parties would be required to keep records for a period of five years.<sup>45</sup>

Refiners and importers would be required to submit an annual report that demonstrates compliance with the applicable benzene standards and data on individual batches of gasoline, including batch volume and benzene content. Based on our experience with other programs, we believe that requiring an annual benzene report and batch information will provide an appropriate and effective means of monitoring compliance with the average standards under the benzene program. Annual reports, on forms provided by the Agency, would be required to be received by EPA by the last day of February of the next calendar year.

EPA is proposing that parties that only blend oxygenates or butane into gasoline not be considered refiners under the proposed rule, and, as a result, would not be subject to the proposed reporting requirements.

We are also proposing that refiners and importers be required to arrange for a certified public accountant or certified internal auditor to conduct an annual review of the company's records that form the basis of the annual benzene compliance report (called an "attest engagement"). The purpose of the attest engagement is to determine whether representations by the company are supported by the company's internal records. Attest engagements are already required under the RFG/CG regulations. The refiner's attest engagement under the RFG/CG rule partially encompasses benzene rule compliance since

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<sup>45</sup> Five years is the applicable statute of limitations for the RFG and other fuels programs. See 28 U.S.C. § 2462.



the attest auditors are already required to verify benzene results for both CG and RFG. Consistent with the RFG regulations, the attest reports for benzene would be included in the presently required attest engagement submitted by May 31 of each year.

9. Exemptions for Research, Development, and Testing

We are proposing to provide an exemption from the proposed benzene requirements for gasoline used for research, development and testing purposes. We recognize that there may be legitimate research programs that require the use of gasoline with sufficiently high benzene levels such that extra effort would be required of the refiner to offset the benzene contribution of the research gasoline. As a result, we are proposing provisions for obtaining an exemption from the prohibitions for persons distributing, transporting, storing, selling or dispensing gasoline that would cause an exceedance of the refiner's annual average benzene standard, or cause the refiner to produce gasoline with sufficiently lower benzene to offset the benzene content of such gasoline if it were included, where such gasoline is necessary to conduct a research, development or testing program. Parties would be required to submit to EPA an application for exemption that describes the purpose and scope of the program and the reasons why use of the higher benzene gasoline is necessary. In approving any application, EPA may impose reasonable conditions such as recordkeeping, reporting, and volume limitations.

10. Liability and Penalty Provisions for Noncompliance

The liability and penalty provisions under the proposed rule are similar to the liability and penalty provisions of the RFG and other fuels regulations.<sup>46</sup> Regulated parties would be liable for committing certain prohibited acts, or causing others to commit prohibited acts. In addition, parties would be liable for a failure to meet certain affirmative requirements, such as the recordkeeping or PTD requirements, or causing others to fail to meet such requirements.

The provisions of section 211(d)(1) of the Clean Air Act (the Act) for the collection of penalties would apply for noncompliance with the proposed rule. The penalty provisions would subject any person who violates any requirement or prohibition of the rule to a civil penalty of up to \$27,500 for every day of each such violation and the amount of economic benefit or savings resulting from the violation. A violation of the applicable average benzene standard would constitute a separate day of violation for each day in the averaging period. The penalty provisions are similar to the penalty provisions for violations of the RFG regulations.

**I. Toxics Performance Standard**

EPA requests comments on an alternative approach that would be based on a toxics performance standard instead of a gasoline benzene content standard. This

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<sup>46</sup> See 40 CFR section 80.5 (penalties for fuels violations); section 80.23 (liability for lead violations); section 80.28 (liability for volatility violations); section 80.30 (liability for diesel violations); section 80.79 (liability for violation of RFG prohibited acts); section 80.80 (penalties for RFG/CG violations).

alternative program would be very similar to the gasoline benzene program described above, but would require that the average toxics performance for gasoline produced at each refinery not increase over the toxics performance of gasoline produced by that refinery during the baseline period, 1998-1999. Annual toxics performance would be determined using the Complex Model in the same way it is determined for our RFG and anti-dumping programs. Like our proposal for the gasoline benzene standard, toxics performance would be determined separately for RFG and CG. Also, like our existing toxics performance requirements described above, the RFG standard would apply to total toxics emissions while the conventional gasoline standard would apply only to exhaust toxics performance. Other components of the program would work in the same way as for the gasoline benzene content standard, described in Section H.

We believe that both of these approaches, the benzene content standard and the toxics performance standard, are consistent with the toxics requirements of the reformulated gasoline and anti-dumping programs, and either one could be used as the basis of a program that seeks to maintain current levels of fuel-based toxics control. However, a toxics performance standard (TPS) approach has some benefits compared to the gasoline benzene content approach. For example, a TPS may provide a toxics control program which offers more flexibility for refiners than the proposed benzene content program. This is because the TPS approach gives refiners more than one fuel parameter to adjust to achieve compliance with the requirements. At the same time, this flexibility varies by refiner, and may not be a benefit to many refiners given that benzene emissions, which are heavily influenced by gasoline benzene content, are the majority of toxics emissions. In addition, a TPS program may be preferable because it would limit emissions of several toxics, as a group, not just benzene.

These benefits, however, must be weighed against some issues that would be raised by adoption of a TPS. First, while a TPS gives refiners more flexibility, it is also the case that refiners may gain a large degree of toxics benefits, as measured by the Complex Model, simply through the gasoline sulfur reduction already required by 2004 instead of through toxics control. In other words, refiners may be able to maintain their current levels of toxics performance by reducing sulfur; this may even allow them to reduce the performance of their fuels with respect to emissions of other toxics as long as the overall toxics performance remains constant. EPA is concerned that codification of the current level of TPS over-compliance would effectively amount to a loss of the toxics benefits of the Tier 2 rule. A second issue associated with the TPS option is that it may not yield the same degree of benzene control as a gasoline benzene content standard, since refiners can opt to adjust aromatics or other fuel parameters instead of holding their benzene levels at or near their 1998-1999 average. EPA requests comment on the importance of each of these issues as well as on ways they can be alleviated if a toxics performance standard is finalized. EPA also seeks comment on whether a TPS approach will offer the same degree of benzene control as a gasoline benzene content standard.

A third alternative, which may alleviate some of the issues associated with a TPS, is to set a benzene emissions performance standard. Under this approach, annual average benzene emissions would be subject to comparison to baseline benzene emissions for

1998-1999, as measured by the Complex Model. Benzene emissions could be measured as they are in the existing fuel control programs, total for RFG, exhaust-only for CG, or we could measure total benzene emissions for both RFG and CG. EPA seeks comment on both alternatives. This approach is somewhat more stringent than the benzene fuel content standard in that it measures benzene emissions associated with a particular fuel formulation and not just the benzene content of the fuel. It is also more stringent than a TPS because it targets benzene specifically. Refiners may favor a benzene emissions performance standard because benzene emissions are a function of several gasoline constituents, and refiners would have greater flexibility when setting their fuel formulations. This option also has the benefit of specifically addressing and maintaining benzene emissions, which are not directly addressed under either the benzene content or the toxics performance standard approaches.

At the same time, EPA is concerned that the same issues described above for the toxics performance standard may also apply to a benzene toxics performance standard. In this case, sulfur controls will allow catalysts to perform more efficiently, resulting in lower exhaust benzene. In addition, a specific benzene emissions performance standard would be more constraining for refiners, in that adjustments to aromatics would impact a refiner's ability to comply with the requirements. EPA seeks comments on whether a benzene emissions performance standard should be applied. EPA also seeks comment on the importance of the issues described above as well as on ways they can be alleviated if a benzene emissions performance standard is finalized.

## **VI. Nonroad Sources of MSAT Emissions**

In this section, we will look at MSAT emissions from nonroad mobile sources.<sup>47</sup> First, we will briefly review the nonroad MSAT emission inventories that were presented in Section III. Next, we will discuss how the current nonroad emission control programs will reduce these nonroad inventories, as well as briefly touch upon the expected benefits from our new actions targeting the control of emissions from currently unregulated nonroad categories.

We are looking at nonroad MSAT emissions separately from motor vehicle MSAT emissions primarily because our understanding of nonroad MSAT emissions is much more limited. This section ends with a discussion of the current gaps in our data that we will need to fill before we can comprehensively assess the need for, and appropriateness of, programs intended to further reduce nonroad MSAT emissions.

### **A. Nonroad MSAT Baseline Inventories**

We previously presented the 1996 baseline inventories for several key nonroad MSAT emissions in Table III-2. This nonroad MSAT data was taken from the 1996 National Toxics Inventory (NTI). In general, the data show that nonroad vehicles tend to be significant contributors of those same MSAT emissions for which motor vehicles are

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<sup>47</sup> "Nonroad" is a term that covers a diverse collection of engines, vehicles and equipment, as described in detail later in this section. The terms "off-road" and "off-highway" are sometimes used interchangeably with nonroad.

also significant contributors. For some MSAT emissions, the nonroad inventories are comparable to, or even higher than, those for on-highway vehicles. Nonroad vehicles contribute as much as 39 percent of the national inventory of some MSAT emissions, such as acetaldehyde and MTBE, and contribute significantly to the national inventories of several others, including 1,3-butadiene, acrolein, benzene, formaldehyde, lead compounds, n-hexane, toluene and xylene.

Table III-4 shows our estimates of on-highway vehicle VOC and diesel PM emissions. Comparing the 1996 values in this table to the nonroad VOC and diesel PM numbers presented later in this section we see that the nonroad VOC inventory in 1996 was almost 80 percent of the on-highway inventory, while the nonroad diesel PM inventory for the same year was roughly twice that for on-highway diesel PM.

## **B. Impacts of Current Nonroad Mobile Source Emission Control Strategies**

### **1. Description of the Emission Control Programs**

The Clean Air Act Amendments of 1990 directed us to study the contribution of nonroad engines to urban air pollution, and to regulate them if warranted. Due to the variety of nonroad engine and equipment types and sizes, combustion processes, uses, and potential for emissions reductions, we have placed nonroad engines into several categories. These categories include land-based diesel engines (e.g., farm and construction equipment), small land-based spark-ignition (SI) engines (e.g., lawn and garden equipment, string trimmers), large land-based SI engines (e.g., forklifts, airport ground service equipment), marine engines (including diesel and SI, propulsion and auxiliary, commercial and recreational), locomotives, aircraft, and recreational vehicles (large land-based spark ignition engines used in off-road motorcycles, “all terrain” vehicles and snowmobiles). Brief summaries of our current and anticipated programs for these nonroad categories follow.

- Land-based diesel engines. Land-based nonroad diesel engines include engines used in agricultural and construction equipment, as well as many other applications (excluding locomotives, mining equipment, and marine engines). Under our Tier 1 standards phased in beginning in 1996, NO<sub>x</sub> reductions of over 30 percent were required of new land-based nonroad diesel engines greater than 50 horsepower (hp).<sup>48</sup> Standards applicable to engines under 50 hp took effect for the first time in 1999. We have completed a second set of standards (Tier 2) which will be phased in from 2001 through 2006 and will require further NO<sub>x</sub> reductions, as well as reductions in diesel PM emissions. Still more stringent NO<sub>x</sub> standards for engines over 50 hp (Tier 3) have been adopted and will be phased in from 2006 through 2008. These Tier 2 and Tier 3 regulations will result in 50 percent reductions in VOC and 40 percent reductions in diesel PM beyond

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<sup>48</sup> 59 FR 31306, June 17, 1994.

the Tier 1 regulations.<sup>49</sup> Finally, we are currently working on appropriate Tier 3 diesel PM standards for land-based nonroad diesel engines.

- Small land-based SI engines. Small land-based spark-ignition engines at or below 25 hp are used primarily in lawn and garden equipment such as lawn mowers, string trimmers, chain saws, lawn and garden tractors, and other similar equipment. Our Phase 1 emission controls for these engines took effect beginning in 1997 and will result in a roughly 32 percent reduction in VOC emissions.<sup>50</sup> We recently completed Phase 2 regulations for these engines which will result in additional reductions in combined HC and NOx beyond the Phase 1 levels of 60 percent for nonhandheld engines and 70 percent for handheld engines.<sup>51</sup>
- Large land-based SI engines. We do not currently have emission standards in place for SI engines above 25 hp used in commercial applications. Such engines are used in a variety of industrial equipment such as forklifts, airport ground service equipment, generators and compressors. We are currently developing an emission control program for these engines.
- Marine engines. Due to the wide variety of marine engine types and applications we have broken them down into three general categories for regulatory purposes. The first category consists of gasoline outboard and personal watercraft engines. Our standards for these engines took effect in 1998 and become increasingly stringent over a nine year phase-in period, ultimately resulting in a 75 percent reduction in VOC.<sup>52</sup> The second category consists of commercial diesel marine engines. Our emission standards for these engines take effect in 2004 and are similar to our standards for land-based nonroad diesel engines.<sup>53</sup> These regulations will ultimately result in VOC reductions of 13 percent and diesel PM reductions of 26 percent for engines subject to the standards. The last category consists of both gasoline and diesel recreational sterndrive and inboard engines. We do not currently have emission regulations in place for this category of marine engine, but have begun developing them.
- Locomotives. Our regulations for locomotives and locomotive engines consist of three tiers, applicable depending on the date a locomotive is

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<sup>49</sup> 63 FR 56968, October 23, 1998.

<sup>50</sup> 60 FR 34582, July 3, 1995.

<sup>51</sup> 64 FR 15208, March 30, 1999 and 65 FR 24267, April 25, 2000.

<sup>52</sup> 61 FR 52088, October 4, 1996.

<sup>53</sup> 64 FR 73300, December 29, 1999.

originally manufactured.<sup>54</sup> The first set of standards (Tier 0) applies to locomotives and locomotive engines originally manufactured from 1973 through 2001, any time they are manufactured or remanufactured. The second set of standards (Tier 1) applies to locomotives and locomotive engines manufactured from 2002 through 2004. The third set of standards (Tier 2) applies to locomotives manufactured in 2005 and later. While the Tier 0 and Tier 1 regulations are primarily intended to reduce NOx emissions, the Tier 2 regulations will result in 50 percent reductions in VOC and diesel PM, as well as additional NOx reductions beyond the Tier 0 and Tier 1 regulations.

- Aircraft. A variety of emission regulations have been applied to commercial gas turbine aircraft engines, beginning with limits on smoke and fuel venting in 1974. In 1984, limits were placed on the amount of unburned HC that gas turbine engines can emit per landing and takeoff cycle. Most recently (1997), we adopted the existing International Civil Aviation Organization (ICAO) NOx and CO emission regulations for gas turbine engines. None of these actions has resulted in significant emissions reductions, but rather have largely served to prevent increases in aircraft emissions. We continue to explore ways to reduce emissions from aircraft throughout the nation.
- Recreational Vehicles. Large land-based spark ignition engines used in recreational vehicles include snowmobiles, off-road motorcycles and “all terrain” vehicles, and are presently unregulated. We are currently developing emission regulations for recreational vehicles.

In addition to the above engine-based emission control programs, fuel controls will also reduce emissions of air toxics from nonroad engines. For example, gasoline formulation (the removal of lead, limits on gasoline volatility and reformulated gasoline) will reduce nonroad MSAT emissions, because most gasoline-fueled nonroad vehicles are fueled with the same gasoline used in on-highway vehicles. An exception to this is lead in aviation gasoline. Aviation gasoline is a high octane fuel used in a relatively small number of aircraft (those with piston engines). Such aircraft are generally used for personal transportation, sightseeing, crop dusting, and similar activities.

As just discussed, most of our fuel controls aimed at gasoline cover both on-highway and nonroad vehicle fuel. The same is not true for diesel fuel. We have regulations in place that have dramatically reduced the sulfur levels in on-highway diesel fuel, and we have proposed further reductions in on-highway diesel fuel sulfur levels. These controls, however, do not apply to nonroad diesel fuel. Prior to the sulfur controls for on-highway diesel fuel, there was no distinction between nonroad and on-highway diesel fuel. We are considering the control of sulfur in nonroad diesel fuel, which would allow more effective diesel PM control technologies such as catalysts to be applied to nonroad engines and vehicles.

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<sup>54</sup> 63 FR 18978, April 16, 1998.

## 2. Emission Reductions from Current Programs

The programs just summarized are expected to result in reductions of national inventories of the MSAT emissions. This section summarizes our estimates of nonroad MSAT inventories into the future, based on the nonroad emission control programs we currently have in place. Interested readers are encouraged to refer to our Technical Support Document for a more detailed discussion of these projections. The discussion in this section consists of three parts. First, we discuss the inventories of four gaseous MSAT emissions: benzene, formaldehyde, acetaldehyde and 1,3-butadiene. Second, we discuss nonroad VOC emissions inventories as a surrogate for the other nonroad gaseous MSAT emissions. Finally, we discuss the trend of nonroad diesel PM emissions.

We are not reporting inventory trends for the metals on our list of MSATs (arsenic compounds, chromium compounds, mercury compounds, nickel compounds, manganese compounds, and lead compounds) or for dioxin/furans. Metals in mobile source exhaust can come from fuel, fuel additives, engine oil, engine oil additives, or engine wear. Formation of dioxin and furans requires a source of chlorine. Thus, while metal emissions and dioxins/furans emissions are associated with particles, there are a number of other factors that contribute to emission levels. While it is possible that these compounds track PM emissions to some extent, we do not have good data on these relationships.

### a. MSAT Emissions

Table VI-1 shows our estimates of four nonroad MSAT emissions. These estimates were based on the 1996 inventories contained in the 1996 NTI study.<sup>55</sup> The 1990 estimates were derived by applying toxic fractions to the nationwide VOC totals from the draft NONROAD model to the 1996 NTI numbers.<sup>56</sup> Toxic fractions represent the fraction of total VOC that a given MSAT makes up. By knowing the total VOC inventory and the toxic fraction for a given MSAT, we can estimate the inventory of that specific MSAT indirectly. The 2007 and 2020 estimates were derived from the draft NONROAD model, with the toxic fractions applied to the nationwide NONROAD VOC results. Toxic fractions were applied separately to the various sources of nonroad emissions (e.g., diesel, gasoline, two-stroke, four-stroke, exhaust, evaporative) in the NONROAD model. Because the toxic fractions for the four MSATs shown vary from one another among the different nonroad emission sources, the percentage reductions of

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<sup>55</sup> It should be noted that these estimates do not include locomotives, aircraft or commercial marine diesel engines. Thus, the 1996 estimates shown here differ slightly from those shown in Table III-2.

<sup>56</sup> The draft NONROAD model is a model we are developing to project emissions inventories from nonroad mobile sources. Because this is a draft model and subject to future revisions, the inventories derived from the draft NONROAD model and presented here are subject to change. The version of the NONROAD model that was used in this analysis is the one we also used in support of our recently proposed 2007 heavy-duty engine rule (65 FR 35429, June 2, 2000).

the four MSATs shown differ from each other.

Table VI-1  
Annual Toxics Emissions Summary for Selected Air Pollutants for the Total U.S.  
Nonroad Mobile Sources from 1990 to 2020  
(thousand short tons per year)

Compound	1990 Emissions	1996 Emissions	2007 Emissions	2020 Emissions
Benzene	100.2	98.7	75.4	69
Acetaldehyde	37.7	40.8	26.3	20
Formaldehyde	79.2	86.4	53.8	40.7
1,3-Butadiene	9.4	9.9	8.8	7.8

Table VI-2 summarizes the percent reductions from 1990 and 1996 levels represented by the inventories in Table VI-1. This table shows that the reductions expected from our existing nonroad control programs are significant, although not as substantial as the reductions of these pollutants for on-highway vehicles presented in Section III.

Table VI-2  
Summary of Percent Emission Reductions in 2007 and 2020 for Selected Air Pollutants  
for the Total U.S. from 1990 or 1996  
Nonroad Mobile Sources

Compound	Reduction in 2007		Reduction in 2020	
	From 1990	From 1996	From 1990	From 1996
Benzene	25%	24%	31%	30%
Acetaldehyde	30%	36%	47%	51%
Formaldehyde	32%	38%	49%	53%
1,3-Butadiene	7%	11%	18%	21%

b. VOCs

With the exception of the four MSATs shown in Table VI-1, we do not have detailed emissions data from nonroad mobile sources for the other gaseous MSAT emissions. Therefore, to estimate projected inventory impacts from our current nonroad mobile source emission control programs, we use VOC inventories. We believe this is appropriate because the gaseous MSAT emissions are constituents of total VOC emissions. By using VOC emissions as a surrogate, we are assuming that MSAT



emissions track VOC reductions. In reality, however, some gaseous MSAT emissions may not decrease at the same rate as VOCs overall. Without having more detailed emission data for each of the MSAT emissions, however, we are unable to offer any insights on how those rates may differ. We request comment on how to develop inventory projections for the other gaseous MSAT emissions.

Our VOC emission inventories were developed using the draft NONROAD model. Because the draft NONROAD model does not include locomotives, commercial marine diesel engines, or aircraft we supplemented the draft NONROAD model inventories with the locomotive and diesel marine inventories developed in support of our regulations for those categories, and with aircraft emission inventories from the National Air Pollutant Emissions Trends, 1900-1996 report. The results of this analysis, presented in Table VI-3, show that VOC inventories are projected to decrease approximately 44 percent between 1996 and 2020 due to existing nonroad mobile source emission control programs. Comparing the results of this analysis with Table III-4, we see that expected nonroad VOC reductions are not as dramatic as those projected for on-highway vehicles, with nonroad and on-highway VOC inventories expected to be very similar by 2020. This analysis shows that our existing nonroad emission control programs will also result in significant gaseous MSAT reductions (assuming, as previously discussed, that gaseous MSAT emissions track VOC reductions).

Table VI-3  
Annual VOC Emissions Summary for the Total U.S.  
Nonroad Mobile Sources

Year	1996	2007	2020
Million short tons per year	3.6	2.2	2.0
Cumulative Percent Reduction from 1996	***	39%	44%

c. Diesel PM

We estimated the nonroad diesel PM inventories using the draft NONROAD model. As explained earlier, because the draft NONROAD model does not include locomotives, commercial marine diesel engines, or aircraft we supplemented the draft NONROAD model inventories using other sources of information to cover these emissions. Table VI-4 shows our estimates of nonroad diesel PM emissions inventories. As can be seen, we expect nonroad diesel PM emissions to begin to drop with the implementation of some of our nonroad regulations. However, in the absence of additional controls, we expect that nonroad diesel PM emission inventories will begin to increase due to expected growth in the populations of nonroad vehicles and equipment. Comparing Table VI-4 to Table III-4 we see that, while the nonroad diesel PM inventory is roughly twice that for on-highway vehicles in 1996, nonroad emissions of diesel PM are expected to be three to four times as great as on-highway diesel PM emissions by

2020.

As was previously mentioned, we are considering appropriate Tier 3 diesel PM standards for land-based nonroad diesel engines. We believe that any specific new requirements for nonroad diesel PM we might propose would need to be carefully considered in the context of a proposal for nonroad diesel fuel standards. This is because of the close interrelationship between fuels and engines -- the best emission control solutions may not come through either fuel changes or engine improvements alone, but perhaps through an appropriate balance between the two. Thus, we are working to formulate thoughtful proposals covering both nonroad diesel fuel and engines.

Table VI-4  
Annual Diesel PM Emissions Summary for the Total U.S.  
Nonroad Mobile Sources

Year	1996	2007	2020
Thousand short tons per year	345.8	282.8	310.8
Cumulative Percent Reduction from 1996	***	18%	10%

### C. Gaps in Nonroad Mobile Source Data

There are significant gaps in our data on MSAT emissions from nonroad engines. As a result of these data gaps our understanding of nonroad MSAT inventories is less developed than our understanding of on-highway vehicle MSAT emissions. The largest single data gap is in the area of emission factors. While we have basic emission factors for VOC and PM for most of the nonroad categories, we have very little VOC speciation data for the given categories which would allow us to use VOC as a surrogate to estimate emissions of specific MSAT emissions. Given the large variety of nonroad engine sizes, types and uses, as well as the likelihood that this variety will result in some differences in VOC composition, it is important that we obtain or develop speciated VOC data specific to each nonroad category in order to more accurately project nonroad MSAT inventories. These gaps, too, must be filled in order to accurately assess the need for, and the most appropriate direction of, any future MSAT control program targeted specifically at nonroad mobile sources.

### D. Summary

In this section we presented our inventory projections of MSAT emissions from nonroad mobile sources. We also briefly discussed the data gaps that need to be filled in order to better understand nonroad MSAT emissions. Our analysis shows that, without further emission control programs, some nonroad gaseous MSAT emissions are expected to decline by almost 50 percent by 2020. However, our analysis also shows that, absent additional controls, nonroad diesel PM emissions are expected to increase in the future.

## **VII. Technical Analysis Plan to Address Data Gaps and Reopening of Rulemaking**

### **A. Technical Analysis Plan to Address Data Gaps**

Because of the continuing potential future health impacts of exposure to the public of air toxics from mobile sources, we propose to continue our toxics-related research activities. Therefore, in addition to proposing today's controls, we believe we must continue to evaluate and re-assess the need for, and level of, controls for both on-highway and nonroad sources of air toxics in the future. Among the 21 compounds that EPA is proposing for inclusion on the list of MSATs, we believe that the Agency should focus its research in the next two years on benzene, diesel exhaust, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein for on-highway and nonroad mobile sources.<sup>57</sup> Agency screening analysis and consultation with the States indicate that these chemicals are likely to present the greatest risks to public health and welfare. This MSATs research will be coordinated with and extend the work that now is underway in the National Air Toxics Assessment (NATA) program that is part of the Urban Air Toxics Strategy.<sup>58</sup>

In conducting future research, EPA plans to address four critical areas where there are data gaps, or the need for additional research and analysis on the exposure of the public to air toxics, and the fuel and vehicle pollution controls that are available to reduce air toxic emissions. They are:

- Developing better air toxics emission factors for nonroad sources;
- Improving estimation of air toxics exposures in microenvironments;
- Improving consideration of the range of total public exposures to air toxics; and
- Increasing understanding of the effectiveness and costs of vehicle, fuel, and nonroad controls for air toxics.

Developing emission factors for nonroad sources. EPA wants to analyze the emissions of several types of commonly used nonroad engines to increase the engine test data it has on the air toxics from nonroad mobile sources. The Agency will then pool the data on air toxics emissions to develop better air toxics emissions factors for these sources.

Improving estimation of exposures in microenvironments. In the past, the Agency has used carbon monoxide (CO) measurements outdoors and indoors as a surrogate for estimating air toxics levels in different microenvironments (e.g., inside vehicles, homes,

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<sup>57</sup>EPA may also focus on other MSATs in the next two years, if new information shows that is appropriate.

<sup>58</sup>EPA's Office of Transportation and Air Quality, which is responsible for the MSATs program, will be working in coordination with the Office of Air Quality Planning and Standards (OAPQS), which manages NATA, and the Office of Radiation and Indoor Air, which is examining issues related to a wide range of indoor air pollutants. OTAQ will also rely on the health effects information and exposure and risk assessment guidelines of EPA's Office of Research and Development in conducting its program.

shopping malls, office buildings, etc.). This approach has limitations. EPA is currently using the Hazardous Air Pollutant Exposure Model - Version 4 (HAPEM4), for estimating microenvironmental exposures in the National Scaling Assessment of NATA. HAPEM4 uses recent, direct technical assessments of the microenvironmental factors for individual chemicals to model the exposures in microenvironments. These microenvironmental factors and the results of their application are currently being peer reviewed. After that review, EPA will incorporate applicable comments into HAPEM4 microenvironmental factors that are needed to provide improved exposure estimates. In the future, it may prove necessary to have new field research undertaken to fill gaps in current data sets such as microenvironmental settings (e.g., “houses with attached garages”). EPA will conduct field work in areas that the Agency judges are critical to provide reasonable exposure results for any major group of the U.S. population.

Another important aspect of considering microenvironmental exposures is the amount of time people spend in each microenvironment. HAPEM4 uses the recently developed Comprehensive Human Activity Database (CHAD) of information describing activities of various subgroups in the U.S. population in different microenvironmental settings. CHAD is a more expansive human activity diary data set than others EPA has used in exposure assessments to date, but the Agency recognizes that additional field research may be needed to expand human activity information for under-represented demographic groups, particularly in urban areas. EPA will update CHAD to take advantage of new data that becomes available through peer-reviewed studies. As CHAD is updated in the future, EPA will make necessary adjustments to ensure that HAPEM4 is providing the best reflection of each subgroup’s activities and enable a reasonable subgroup analysis where EPA would be likely to gain additional insights about the health effects occurring for particular groups. In addition, the Agency will review the data to see where special analysis is warranted to isolate the subgroups facing greater risks.

Improving consideration of the range of public exposures. EPA’s analysis to date has primarily examined average levels of exposure. However, as the Agency has stated in the Urban Air Toxics Strategy, EPA also wants to consider the disproportionate impacts of air toxics in “hotspot” areas. Hotspots are generally thought of as areas with elevated pollutant levels that could be associated with potentially serious health risks. The HAPEM3 modeling framework that EPA used for conducting the 1999 EPA Air Toxics Study described in Section I.E. above could not address this issue.<sup>59</sup> States and local air pollution control agencies have raised the hotspots issue as a major concern that needs to be addressed in a proper air toxics risk characterization.<sup>60</sup> Initially, EPA needs to develop and evaluate approaches that allow a reasonable examination of the concern over

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<sup>59</sup>Analysis of the Impacts of Control Programs on Motor Vehicles Toxics Emissions and Exposure in Urban Areas and Nationwide (Volumes 1 and 2), November 1999. EPA420-R-99-029/030. This report can be accessed at <http://www.epa.gov/otaq/toxics.htm>.

<sup>60</sup>STAPPA/ALAPCO and NESCAUM raised this concern at an conference on mobile source air toxics that the Health Effects Institute managed for EPA in February 2000.

hotspots. Upon finding a reasonable way to address this issue, the Agency plans to assess the impacts of elevated air toxics in certain areas over the next two years. EPA will work with the State and local air pollution control agencies to ensure that the results of air toxics monitoring data analyses and urban monitoring pilot projects scheduled to be completed in the next year are considered in EPA's development of mobile source air toxics exposure and risk analyses.<sup>61</sup>

Additionally, EPA will evaluate the feasibility of improving the local-scale accuracy of the ASPEN model. More accurate and reliable local scale-modeling of ambient air toxics concentrations will better inform the Agency and the public about potential "hot spots." This information will also improve HAPEM exposure estimates.

Increasing understanding of the effectiveness and costs of vehicle, fuel, and nonroad air toxics controls. The Agency intends to conduct additional analysis on the types of controls that it could have for vehicles, fuels, and nonroad engines to lower emissions cost-effectively in a reliable and predictable manner. For the seven air toxics mentioned above, the Agency will analyze a variety of control options, including a reevaluation of previously considered control options, for both on-highway and nonroad sources. Based on the results of this work, EPA plans a more detailed engineering feasibility, performance, and cost analysis for the most promising technical approaches and a re-assessment of the level of air toxics controls for these sources.

In all of these research areas, EPA wants to work collaboratively with industry representatives, manufacturers of emissions control technology, State and local agencies, environmental groups, and other stakeholders. In keeping with this approach, the Agency plans to hold at least three technical workshops with all interested stakeholders to consider:

- improvements EPA should make to ASPEN and HAPEM4 to enable the Agency to better assess the risks from air toxics;
- ways to address the significance of the hotspots issue;<sup>62</sup> and
- available vehicle, fuel, and nonroad control technologies for reducing air toxics.

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<sup>61</sup>EPA will characterize the exposure risks of air toxics in future analysis in the manner prescribed in the Agency's *Guidance for Risk Characterization*, February 1995.

<sup>62</sup>This workshop would include ways to qualify and quantify the geographic and exposure/risk impacts of mobile source emissions, considering both the ubiquitous ambient impact as well as potential hotspots. It would further assess how to examine for hotspots the geographic and exposure variability that exists for air toxics. Geographic variability includes the observed elevated urban area ambient concentrations of mobile source air toxics, peak ambient concentrations adjacent to roadways in urban and rural areas, and the elevated, mobile source-dependent emissions impacts (for example, waste transfer station operations and bus, marine, aircraft, and locomotive terminal operations). Exposure variability includes recognition of factors that lead to different levels of human exposure, such as commuting, or living in a residence with an attached garage.

The results of this research will provide the basis for any future rulemaking, as discussed below.

EPA solicits comments on this plan to support the Agency's future decisions on MSAT controls. The Agency also solicits submission of any documents with relevant technical research of which commenters believe the EPA may be unaware, or descriptions of research activities commenters believe the Agency should pursue.

#### **B. Commitment for Further Rulemaking**

EPA is also proposing a regulatory provision providing for a future rulemaking that will determine, based on the information available at that time, what additional motor vehicle or fuel controls would be appropriate to control emissions of hazardous air pollutants from motor vehicles and their fuels. This rulemaking would reassess the appropriateness of the then current standards under the Clean Air Act including the need for and technical and economical feasibility of further controls. The standards that have been promulgated by EPA or that are promulgated pursuant to today's proposal would stay in effect unless revised by this subsequent rulemaking procedure. EPA commits to issue a proposed rule by the end of 2003, and to take final action by the end of December of 2004.

As part of this rulemaking, EPA will reexamine the controls available for reducing emissions of benzene as well as the other hazardous air pollutants emitted from on-highway and nonroad vehicles and equipment and their fuels. EPA will reassess the reductions in toxics emissions expected to be achieved by the current suite of motor vehicle and fuel controls that will be implemented over the next several years as well as the potential for innovative control technologies to provide further reductions. In 2004, EPA will also be able to better determine the appropriateness of additional fuel controls in light of potential developments being considered by Congress, EPA and States with respect to MTBE and the oxygen content of gasoline. Finally, the review will consider the contribution of nonroad engines to emissions of air toxics and whether controls that reduce these emissions along with motor vehicle emissions are appropriate under the Act

### **VIII. Public Participation**

#### **A. Comments and the Public Docket**

Publication of this document opens a public comment period on this proposal. You may submit comments during the period indicated under "DATES" above. The Agency encourages all parties that have an interest in the program described in this document to offer comment on all aspects of the action. Throughout this proposal you will find requests for specific comment on various topics.

The most useful comments are those supported by appropriate and detailed rationales, data, and analyses. We also encourage commenters who disagree with the proposed program to suggest and analyze alternate approaches to meeting the air quality goals of this proposed program. You should send all comments, except those containing proprietary information, to the EPA's Air Docket (see "ADDRESSES") before the date specified above for the end of the comment period.

Commenters who wish to submit proprietary information for consideration should

clearly separate such information from other comments. Such submissions should be labeled as “Confidential Business Information” and be sent directly to the person listed (see “FOR FURTHER INFORMATION CONTACT”), not to the public docket. This will help ensure that proprietary information is not placed in the public docket. If a commenter wants EPA to use a submission of confidential information as part of the basis for the final rule, then a non-confidential version of the document that summarizes the key data or information must be sent to the docket.

We will disclose information covered by a claim of confidentiality only to the extent allowed by the procedures set forth in 40 CFR Part 2. If no claim of confidentiality accompanies a submission when we receive it, we will make it available to the public without further notice to the commenter.

### **B. Public Hearings**

We will hold a public hearing as noted under “DATES” above. If you would like to present testimony at the public hearing, we ask that you notify the contact person listed above two weeks before the date of the hearing. You should include in this notification an estimate of the time required for the presentation, and any need for audio/visual equipment. We also suggest that sufficient copies of the statement or material to be presented be made available to the audience. In addition, it is helpful if the contact person receives a copy of the testimony or material before the hearing.

The hearing will be conducted informally, and technical rules of evidence will not apply. A sign-up sheet will be available at the hearing for scheduling the order of testimony. Written transcripts of the hearing will be prepared. The official record of the hearing will be kept open for 30 days after the hearing date to allow submittal of supplementary information.

## **IX. Administrative Requirements**

### **A. Administrative Designation and Regulatory Analysis**

Under Executive Order 12866 (58 FR 51735 October 4, 1993), EPA must determine whether the regulatory action is "significant" and therefore subject to Office of Management and Budget (OMB) review and the requirements of this Executive Order. The Order defines a "significant regulatory action" as one that is likely to result in a rule that may:

- (1) Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, Local, or Tribal governments or communities;
- (2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- (3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients thereof; or
- (4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

EPA has determined that this rule is a “significant regulatory action” under the

terms of Executive Order 12866 because it raises novel legal or policy issues and is therefore subject to OMB review. The Agency believes that this regulation would result in none of the economic effects set forth in Section 1 of the Order.

#### **B. Regulatory Flexibility Act**

The Regulatory Flexibility Act, 5 U.S.C. 601-612, generally requires federal agencies to conduct a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include businesses, small not-for-profit enterprises, and small governmental jurisdictions. This proposed rule would not have a significant impact on a substantial number of small entities because the standards as proposed seek to hold gasoline benzene fuel content to levels previously achieved by refiners in 1998 and 1999. The proposed standards would not require refiners to purchase equipment or to change their refining practices in new and unique ways. Today's proposed program also does not create requirements that would affect the ways in which fuels are transported or stored.

Therefore, I certify that this action will not have a significant economic impact on a substantial number of small entities.

#### **C. Paperwork Reduction Act**

The information collection requirements (ICR) in this proposed rule will be submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* We will announce in a separate Federal Register Notice that the ICR has been submitted to OMB.

The Agency may not conduct or sponsor an information collection, and a person is not required to respond to a request for information, unless the information collection request displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

#### **D. Intergovernmental Relations**

##### **1. Unfunded Mandates Reform Act**

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104-4, establishes requirements for Federal agencies to assess the effects of their regulatory action on state, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures by state, local, and tribal governments, in the aggregate, or by the private sector, of \$100 million or more in any one year. Before promulgation an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted.

Before we establish any regulatory requirement that may significantly or uniquely



affect small governments, including tribal governments, we must develop, under section 203 of the UMRA, a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of our regulatory proposals with significant federal intergovernmental mandates. The plan must also provide for informing, educating, and advising small governments on compliance with the regulatory requirements.

EPA believes this proposed rule contains no federal mandates for state, local, or tribal governments or for the private sector as defined by the provisions of Title II of the UMRA. Nothing in the proposed rule would significantly or uniquely affect small governments.

#### Executive Order 13132 (Federalism)

Executive Order 13132, entitled “Federalism” (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure “meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.” “Policies that have federalism implications” is defined in the Executive Order to include regulations that have “substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.”

This proposed rule may have federalism implications, as specified in Executive Order 13132, by preempting state and fuel benzene controls. The proposed standards will impose no direct compliance costs on states. Thus, Executive Order 13132 does not apply to this rule.

EPA consulted with state and local officials in the process of developing the proposed regulation to permit them to have meaningful and timely input into its development. In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

#### 3. Executive Order 13084: Consultation and Coordination with Indian Tribal Governments

Under Executive Order 13084, EPA may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian tribal governments, and that imposes substantial direct compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or EPA consults with those governments. If EPA complies by consulting, Executive Order 13094 requires EPA to provide to the Office of Management and Budget, in a separately identified section of the preamble to the rule, a description of the extent of EPA’s prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires EPA to develop an effective process permitting elected and other representatives of Indian tribal governments “to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.”

The proposed rule does not create any mandates or impose any obligations, and thus does not significantly or uniquely affect the communities of Indian tribal governments. Accordingly, the requirements of section 3(b) of Executive Order 13084 do not apply to this rule.

#### **E. National Technology Transfer and Advancement Act**

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Pub. L. 104-113, 12(d) (15 U.S.C. 272), directs the EPA to use voluntary consensus standards (VCS) in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, business practices, etc.) that are developed or adopted by voluntary consensus standard bodies. The NTTAA requires EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rule references technical standards adopted by the Agency through previous rulemakings. No new technical standards are proposed in today's document. The standards referenced in today's proposed rule involve the measurement of gasoline fuel parameters. The measurement standards for gasoline fuel parameters referenced in today's proposal are government-unique standards that were developed by the Agency through previous rulemakings. These standards have served the Agency's emissions control goals well since their implementation and have been well accepted by industry.

EPA welcomes comments on this aspect of the proposed rulemaking and, specifically, invites the public to identify potentially applicable voluntary consensus standards and to explain why such standards should be used in this regulation.

#### **F. Executive Order 13045: Children's Health Protection**

Executive Order 13045: "Protection of Children from Environmental Health Risks and Safety Risks" (62 FR 19885, April 23, 1997) applies to any rule that: (1) is determined to be economically significant as defined under E.O. 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

EPA believes this proposed rule is not subject to the Executive Order because it is not an economically significant regulatory action as defined by E.O. 12866.

#### **X. Statutory Provisions and Legal Authority**

The statutory authority for the fuels controls proposed in today's document can be found in sections 202 and 211(c) of the Clean Air Act (CAA), as amended. Additional support for the procedural and enforcement-related aspects of the fuel controls in today's proposal, including the proposed recordkeeping requirements, come from sections 114(a) and 301(a) of the CAA.

**List of Subjects**

40 CFR Part 9

Reporting and recordkeeping requirements

40 CFR Part 80

Administrative practice and procedure, Air pollution control, Confidential business information, Environmental protection, Gasoline, Labeling, Motor vehicle fuel, Motor vehicle pollution, Penalties, Reporting and recordkeeping requirements

40 CFR Part 86

Administrative practice and procedure, Air pollution control, Confidential business information, Environmental protection, Labeling, Motor vehicle emissions standards, Motor vehicle pollution, Penalties, Reporting and recordkeeping requirements

Dated: \_\_\_\_\_

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Carol M. Browner,  
*Administrator*